RAILROAD GAZETTE

FRIDAY, JAN. 19, 1894.

CONTENTS.



## Contributions.

### Haarmann's Work on Track.

CHICAGO, Jan. 10, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

During the Columbian Exposition American railroad engineers visiting our exhibit frequently expressed the wish to become possessors of copies of Mr. A. Haarmann's work, "Das Eisenbahngeleise" (The Railroad Track). I failed, however, to take note of their names and addresses.

Since then I have received a few copies, and as it is safe to presume that those gentlemen are subscribers to your valuable publication, a short notice in the same to the effect that they can have a copy of the work in question at the *trade* price of $9.50 would be most likely to reach them and might be welcome news to them.

DR. A. VIETOR.

### Pocket Book Chemistry.

*Chicago, Milwaukee & St. Paul Railway,*
MILWAUKEE, Jan. 9, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

I note in your issue of Jan. 5 a review of the very excellent paper by Professor Stillman on "The Examination of Cement," but am surprised that in speaking of the analytical table you say: "It is in such form that any young engineer can go into a laboratory and make his analysis of cement without further instructions." Now Trautwine's Pocket Book is a valuable reference book, but one might with equal consistency place it in the hands of any young chemist, and set him to building bridges "without further instructions."

I criticise this statement, not for its own sake, but because there appears to be an impression among some mechanical men that almost any one can make chemical analyses. This is especially liable to be the case with those young engineers who imagine that the short course of instruction which they have received in elementary analysis represents chemistry. Any intelligent person may in a few weeks learn to perform the mechanical manipulation of an analysis, with the necessary neatness and accuracy, but that does not constitute him a chemist, or even qualify him for general analytical work. When an engineer is competent to be his own physician, his own lawyer, and his own spiritual adviser, he may also think of being his own chemist. Meanwhile, if he would insist on having all his analyses made by competent professional chemists, he might have less to say about inaccuracy and discrepancy in chemical work.

H. E. SMITH. Chemist.

### The Points That Go To Make a Good Freight-yard.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It is a great pleasure to examine Mr. Scott's plan of a freightyard given in your issue of Jan. 5. Its two main features are extremely good and the yard in practice would undoubtedly work well. These two main features are, first, the arrangement under which cars can be dropped through each series of yards without reverse motion, and second, the arrangement by which the grade is utilized for the drilling of cars whose general movement is up grade. This latter end is accomplished by the simple expedient of placing the receiving yard at the top of the grade and hauling trains up grade beyond the classification yards to the receiving yard, from which cars are dropped back through the classification yard to the starting yard. This last feature of a starting yard for holding classified trains is, I believe, new in this country, and certainly must add greatly to the elasticity of the yard.

After giving much credit to this design, I hope I may be pardoned if I point out a few minor points in which an improvement might, perhaps, be made. I notice that the eastbound freights have to cross the westbound passenger tracks both in entering and leaving the yard. This could have been avoided by putting the westbound passenger tracks north of the yard, and retaining the eastbound passenger tracks south of the yard,—in other words by running the passenger tracks wholly outside the freight yard. This course is not practicable if there should be a passenger station on one side of the freight yard as might easily be the case.

Further, I notice that the receiving yard has eight tracks each long enough to hold two full trains. Would it not be better to make these tracks each only long enough for one train? If this is not done the second train cannot be put upon one of these tracks without first cutting off the engine on the main track. In the same way the classification tracks should be arranged each to hold a train. When this is done each train departing from the starting lines will make it practicable to wholly clear one of the classification tracks, rendering a change in the classification practicable if desired. A short track in both receiving and classification lines also renders it practicable to give preference to certain cars by dropping the cars on that track more quickly. Of course any space that is lost by shortening the tracks should be made up by providing more of them. If it is found that it is more convenient to make a long yard than a broad one, then the same number of tracks can be grouped in two yards, one immediately below the other, forming one classification yard. The same reasons for making the tracks of a train length apply to the starting yard.

I notice that Mr. Scott makes no provision for putting the cars on his trains in station order. This is usually done by the shifting engine at the head of the yard, to the great delay of everything else. Would it not be better if a series of short tracks were provided on which to do such work?

There are some minor points on which issue might also be taken with Mr. Scott. He states that a switch tower should be placed in the middle of the ladder. Is it not more general to place such a tower at the end of the latter so that the switchman can see all his switches at once?

Again, Mr. Scott says it is better to tack manifests to the sides of the cars than to hold them in the yardmaster's office when not in use by yard conductors, etc. To my mind the yardmaster should have in his office a series of pigeon-holes, one for each track, and in each pigeon-hole he should have the card manifests for the cars on that track. Otherwise I hardly see how the yardmaster can know what he is about; but I am aware that many more old railroad men besides Mr. Scott advocate the tacking of the manifests upon the cars.

To conclude, I have not seen such a good yard design in your columns since you printed the diagram of the Edgehill yards, and I hope that some one will build Mr. Scott's yard either with or without improvements.

H. D. W.

### Relative Cost of Pneumatic and Lever Interlocking.

RAHWAY, N. J., Jan. 15, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

The *Engineering News* of Jan. 11 publishes a letter from Mr. J. P. O'Donnell, of London, Consulting Engineer of the National Switch & Signal Co., taking exception to certain statements concerning the electro-pneumatic interlocking plant recently installed at Stewart avenue, Chicago, Ill., made in connection with the elaborate publication by the same journal in the issue dated Nov. 16, 1893.

I believe it is generally known, to those railroad men who are interested in this matter of signaling, that my colleagues have from the first introduction of pneumatic interlock-ing endeavored to correct the dexterous sophistry employed by our friends at Pittsburgh in attempting to force their patent on the long-suffering railroad companies.

Mr. O'Donnell's experience in signaling entitles his opinion to some respect, and I am sure it would help a great many of our operating officers and engineers to come to a conclusion, with reference to the most desirable practice, if we could have a consensus of opinion from competent signal experts.

In the letter referred to, Mr. O'Donnell clearly shows that the estimate as to 36 men per day, besides repairmen, being required to operate a *usual* interlocking at Stewart avenue, is very incorrect. The terminus interlocking at Waterloo, installed by Stevens & Sons, and which controls a system of tracks almost equal in complexity to Stewart avenue, requires only 12 signalmen per day, and a portion of the time of one repairman and two assistants. Sixteen attendants are required at the Stewart avenue pneumatic plant, and its operation and maintenance cost about $1,200 per month. Then, again, when we consider that a greater volume of traffic is dealt with at Waterloo terminus than at Stewart avenue, and that rigid block working is in force at the former plant, the comparison is still less in favor of the pneumatic system.

A comparison which I made between two parrallel sets of interlocking at Jersey City, one of which is lever work and the other pneumatic, shows that the cost of operating and maintaining the lever interlocking is less than the pneumatic, although the lever machines deal with a larger number of trains, with track accommodation much inferior to the other.

I wish to point out some weak practice peculiar to the pneumatic system. There are not enough signal arms supplied to safely designate routes. This practice certainly saves a great deal of expense and complication in pneumatically operated signals, but it hardly seems right to humor pet ideas in mechanism to that extent.

The advocates of the pneumatic system claim that it has advantage over the lever system, inasmuch as the switches can be operated at any distance from the signal tower. Practical experience in this respect has taught us that the lever machines will satisfactorily operate at safe distances when properly installed, and that the safety limit is governed by the questions of sight and location, and not by the form of interlocking machine in vogue. There are pneumatic machines in service which overstep this safety limit.

Then there is the unreliability of the detector bar when operated by power. With a detector bar operated by the usual method, the full lever power is seldom exerted in attempting to unlock a switch while it is occupied by a train, because the signalman feels the obstruction at once and desists from the attempt. But in the pneumatic system the full indiscriminate force of the cylinder is exerted on the detector bar, resulting too often in rupture of the bar and splitting the train.

Not only does a pneumatic plant require a high class of operating and maintenance skill, but it has also been found very advisable to have an engineer of considerable skill to superintend the erection. Of course there are a good many inferior grades of lever interlocking in use, and the plain remedy is to employ none but experienced and competent contractors.

ARTHUR H. JOHNSON,
*Consulting Engineer The Johnson R. R. Signal Co. and The Hall Signal Co.*

### The Louisville & Jeffersonville Bridge.

CHICAGO, Ill., Jan. 8, 1894.

TO THE EDITOR OF THE RAILROAD GAZETTE:

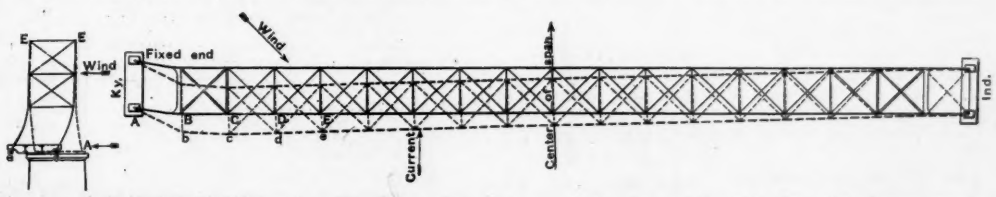
The disaster to the Louisville & Jeffersonville bridge on Dec. 15 possesses great engineering interest. The probable causes of the fall of the second span are not apparent from the discussion thus far made public. After reading the full accounts which have appeared in the engineering periodicals I venture to give you my conclusions, thinking they may be of interest, particularly to such of your readers as have not made a specialty of bridge construction.

Mr. John Sterling Deans' first letter contains the following statement: "The trusses, including the upper lateral bracing and the transverse bracing, are first put in place. The span is then swung off without any floor or lower laterals in position, and, as far as the falsework is removed, this floor and lower laterals are put in place."

If this means that the bridge is left without falseworks at any time before the floor and lower laterals are in place complete, I know of this method of erection only as an extraordinary procedure, resorted to in case there is imminent danger of the falseworks going out and doing damage to the span. It is not the usual method. As long as the floor beams and lower laterals are not in place the falseworks are needed to secure the span in case of a wind storm. It is true the blocking is taken out as soon as the trusses are connected, but it is the work of only a few minutes to put it back, if, at any time, the safety of the structure is threatened by wind. The falseworks should, therefore, remain in place until the lower lateral system is complete, and this has been my own practice and the practice of all others in the cases of which I have knowledge.

The most remarkable feature about this span, however, was that it had been standing without falseworks for weeks and still the lower laterals in the two end panels next to the fixed end of the span were not in place. The strain in the lower end lateral, as given on the strain sheet of the Phœnix Bridge Co., is 231,000 lbs., requiring two 5 in. × $1\frac{9}{16}$ in. bars to take care of it. Even assuming an ordinary wind blowing it is therefore evident that here was an enormous force practically left unprovided for.

I have endeavored to illustrate by the sketch accompanying this letter the action of the span under these conditions, when subjected to a wind of the direction blowing at the time. The full lines in the plan indicate the upper chords, and the dotted lines the lower chords. The dislocation of the parts is, of course, exaggerated.




As the upper lateral and portal bracing were in place

complete, the upper chords and end posts (excepting below the portal bracing) would remain straight. The lower chords, however, near the fixed end of the span, would assume the form of a catenary; they would depart from the straight line considerably, and would exert a considerable pull upon the lower ends of the end posts.

At *e*, where the first intermediate post occurs, most of the wind pressure which the lower system was expected to resist would be transferred by the sway bracing to the upper lateral system, and thence to the portal bracing. The work which the portal bracing and end posts would thereby be called upon to perform would be more than double the normal work for which they were proportioned. Furthermore, the parts were connected by field bolts only, and there was a joint in the end posts near the lower portal strut, where they would be subjected to great bending strains, and the splice plates for this joint were only bolted.

Mr. Cornwell, in a communication to the *Engineering Record*, states that he found only 17 bolts used in 47 rivet holes *visible* in the joint of the southeast end post. It is not difficult to see, therefore, that with this condition of things only an ordinary wind storm would be required to break the connection at the lower portal strut. The very considerable force which the lower chords, acting as horizontal catenaries, would exert upon the end posts, tending to dislodge them from their support on the shoes, is not here considered, as it is not likely that this caused the failure of the span in the first place.

The wind *may* have exerted an upward pressure, in addition to the side pressure, and it *may* have blown with the force of a tornado upon this span, although it did not do so in the country around. Yet these conditions are not all required to explain the disaster, the primary cause of which was undoubtedly the omission of the lower laterals in the two end panels.

The disaster to the span, which was incomplete and resting upon its falseworks, is easily accounted for. In this case, however, the contractors were justified in assuming certain risks. The piles were left without sway bracing for about 30 ft. of height immediately above the river bottom. There are plenty of precedents for this, but it will hardly be claimed that it is good practice. The piling was in such condition that it could resist the wind pressure only by the transverse bending strength of the individual piles. The piles would be overstrained under a severe wind, and, at best, there would be considerable swaying and getting out of plumb. This would loosen the hold which the piles had in the river bottom. It would not require much side motion with a structure so topheavy and so lightly braced transversely, to cause such a shifting of loads and loosening and overstraining of parts as to bring about a collapse. These causes alone are quite sufficient to explain the failure of the structure, without assuming any scouring or uneven settling.

The falseworks used are not much different from falseworks which have been used under similar bridges. They are as heavy and as well braced as some, and, considering the unusual size of the span, they are lighter and less well braced than other, previous examples.

It is not a great expense to use sway bracing on piles next to the river bottom, even if this bracing is under water, as in the present case. There are various devices for putting in bracing under water conveniently and cheaply. The use of such bracing in this case would have added greatly to the stability of the structure. That it should be used in all similar cases is, in my opinion, one lesson to be learned from this disaster.

The other lesson which this disaster teaches is that it is not safe to leave a big span exposed to the wind without lateral bracing in place throughout the length of the span. One would not suppose that prudent and skillful bridge erectors would require to be taught this lesson, but we all know that the forces of the wind are so often ignored with impunity that perhaps a great disaster was needed to give emphasis to its power and the necessity of making proper provision against its effects.

C. L. STROBEL.

## A Simple Method of Lowering a Bridge.

In connection with the improvements now being made by the New York, New Haven & Hartford, through the city of Mount Vernon, N. Y., it has been found necessary to erect several of the overhead bridges upon temporary blocking, in order to provide sufficient headroom for the present traffic until the tracks could be lowered to the permanent grade. The blocking could then be removed and the bridges placed upon their permanent seats.

In the case of Park avenue bridge, located just east of the station, and spanning the station grounds as well as the tracks, the grades required that the south end of a 180-ft. span be blocked up 3 ft. above its permanent position. The bridge being 60 ft. wide, and of unusually heavy construction, being designed to carry, in addition to the usual loads, a 15-ton Aveling & Porter road-roller owned by the city, it was at first thought necessary to replace half the falsework and to otherwise stiffen the truss, preparatory to lowering the bridge. But this plan was rejected as too expensive, and it was decided not to go beyond the bridge seats for support.

The plan then proposed was to cut the coverplate of the end posts and to lower the bridge into position by means of suspenders around the end jams. This, however, necessitated a permanent injury to the coverplate, and the device shown in the accompanying illustration was finally designed; and the work was carried out under the direction of Mr. H. B. Seaman, the engineer in charge of the improvements on this part of the road.

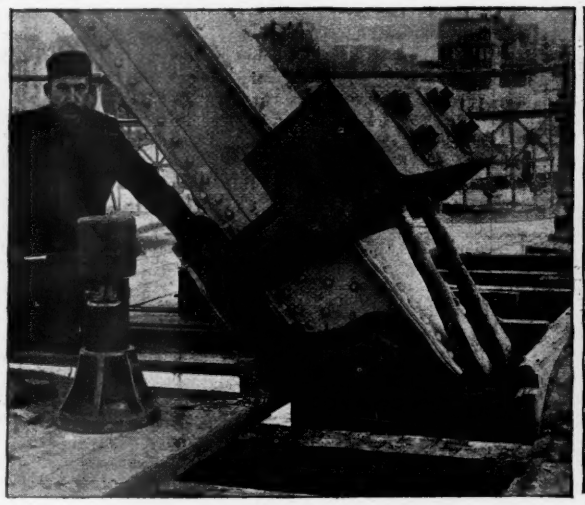


Fig. 1—Sixteen Inch Pine Block.

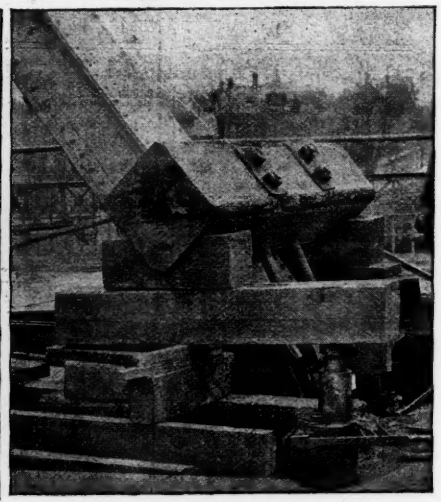


Fig. 2—Eighteen Inch Oak Block.

Device for Lowering a Heavy Bridge.

The inclined end post was clamped by a 16 in. × 16 in. yellow pine timber, bolted around the post by four 2-in round bolts, which passed through heavy plates beneath the posts. The timbers were also fastened to the end of the post by two 2¼-in. rods, having claws forged at their ends to grip the webs of the post. The claws were provided with lugs, which hooked over the angleplates to prevent slipping off the web; but the inclination of the rods from the posts was so small that there was little tendency to slip, and the use of the lugs was merely a precautionary measure.

It will be noticed that the arrangement placed the timber almost directly over the pin, and thus prevented any tendency to bend the end post. Four 40-ton hydraulic jacks were provided, two for each truss. A jack was placed under each end of the timber on the west truss, and the truss was successfully lowered 3 in., but when the jacks were applied to the east truss, it was found that the distortion of the truss had thrown

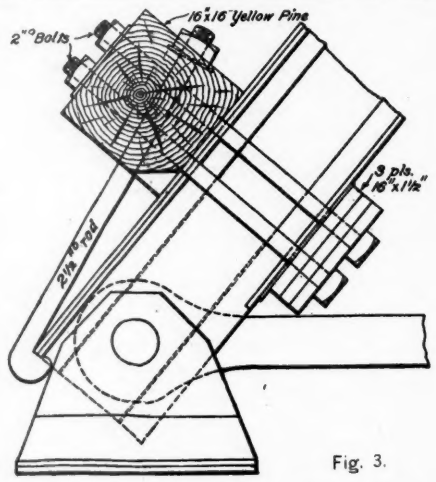



Fig. 3.

extra weight upon the higher pedestal, and two jacks were insufficient. All four were, therefore, applied to the one truss. The timber then began to split vertically on account of the extreme pressure on its corner.

New oak timbers 18 in. × 18 in. were then ordered, and were made about 2 ft. longer than the first blocks, to prevent splitting. An inverted wood saddle was also provided to bring the pressure upon the sides of the oak timber.

The four 40-ton jacks were then applied to each truss alternately, and the bridge successfully lowered into position. After the blocks were satisfactorily placed, it required only half a day to lower the trusses.

The method adopted was simple and thoroughly effective, and there is practically no limit to the size of truss which might be thus handled with proper modification of sizes of rods, etc., and in extreme cases by replacing the timber with iron.

## New York Railroad Commissioners' Report.

The Railroad Commissioners of the State of New York, Samuel A. Beardsley, Michael Rickard and Alfred C. Chapin, have issued the eleventh annual report of the Board. It is dated Jan. 8, and the statistics are for the year ending June 30, 1893. The opening chapter contains general remarks about the business situation and refers to the strength and soundness of railroad and other properties in New York, owing to their accumulated wealth. The Empire State Express continues to be successful and the year is made memorable by the 20-hour train between New York and Chicago. The advanced methods of equipment and management embodied in this train are referred to as making its safe record possible, and a contrast is drawn between this example of modern railroading and the "ruder methods and equipments in certain quarters" where serious accidents have taken place.

The taxes paid by the railroads in New York State for the year were $7,270,197, and for the previous year $6,264,159. The miles of road in New York State on June 30 were 7,888, an increase of 118 over the previous year.

The Board has considered 68 complaints during the year and had 32 applications for change of motive power on street railroads. There have been 26 applications for increase of capital stock and nine for permission to build new railroads. There have been few complaints about freight rates. There are many disputes between farmers and railroads as to what kind of a fence should be provided in particular cases, and it is held that the law ought to be made more definite. It appears that after a fence is erected some farmers, making a change in their business which requires a different fence, ask the railroad to tear down and rebuild. Complaints that locomotives set fires are less numerous than formerly. This is said to be due to the improved screen adopted at the suggestion of the Commissioners. On the new Adirondack road, where there was some anxiety on account of the valuable timber lands traversed, there have been no complaints whatever. This is due to the fact that the locomotives are compound, with a soft blast, and to the great care exercised by the officers and employes.

The accident record shows a large increase over the previous year, but this is partly due to more complete reports. The principal items for the year ending June 30, 1893, are shown in the accompanying table:

CASUALTIES ON RAILROADS IN NEW YORK STATE, YEAR ENDING JUNE 30, 1893.

| | Passengers. | | Employees. | | Others. | | Total. | |
|---|---|---|---|---|---|---|---|---|
| | Killed. | Injured. | Killed. | Injured. | Killed. | Injured. | Killed. | Injured. |
| Fell from train | 2 | 17 | 44 | 154 | 8 | 27 | 54 | 198 |
| Walking or being on track | 2 | 1 | 112 | 85 | 197 | 113 | 311 | 199 |
| Coupling or uncoupling cars | 0 | 0 | 26 | 775 | 0 | 5 | 26 | 780 |
| Found dead on track | 1 | 0 | 24 | 0 | 83 | 0 | 108 | 0 |
| At protected highway crossings | 0 | 0 | 1 | 1 | 27 | 48 | 28 | 49 |
| At unprotected highway crossings | 0 | 0 | 2 | 2 | 56 | 61 | 58 | 63 |
| Caught in frogs, etc | 0 | 0 | 11 | 18 | 0 | 1 | 11 | 19 |
| Train accidents | 10 | 145 | 39 | 177 | 3 | 16 | 52 | 338 |
| Other causes | 15 | 108 | 47 | 410 | 32 | 124 | 94 | 642 |
| Total | 30 | 271 | 306 | 1,622 | 406 | 395 | 742 | 2,288 |
| From causes beyond their own control | 10 | 178 | 81 | 478 | 19 | 51 | 109 | 707 |
| By their own misconduct or want of caution | 18 | 79 | 194 | 1,109 | 345 | 304 | 558 | 1,492 |
| Reported as caused by intoxication | 2 | 13 | 2 | 3 | 32 | 34 | 36 | 50 |
| Indeterminable as to want of caution or otherwise | 0 | 1 | 29 | 32 | 10 | 6 | 39 | 39 |
| | 30 | 271 | 306 | 1,622 | 406 | 395 | 742 | 2,288 |

The dangers of grade crossings are discussed and the recommendation that, where changes are made, half of the expense shall be borne by the railroad, is repeated from last year's report. Legislative action looking to the beginning of the abolition of crossings is urged. Attention is called to the increased danger at crossings due to the high speed of passenger trains.

The number of freight cars equipped with automatic couplers is now about one-third of the total, and with automatic brakes about one-tenth. Eleven persons have been killed and 18 injured by having their feet caught in guard rails or frogs, and a law compelling the use of blocks is recommended. On the subject of car lighting, gas is commended, and the recommendation of last year that the use of oil should be prohibited by law is repeated. It was found on inquiry that the quality of the illuminating oil used on most of the steam roads was such as to comply with the law, but most of the street railroads were not complying, and the Board is now looking after them.

Last year's paragraph concerning the danger of running passenger cars of light construction is repeated. The changes incident to the adoption of automatic couplers and air-brakes on freight cars are referred to and railroad managers reminded of the necessity of better supervision and construction and of care in loading old and weak cars. The advisability of equipping freight cars with safety chains is suggested as a question for investigation and also the need of a freight car door less liable to be torn off. The need of getting rid of the five dangerous drawbridges on the New York Central between Albany and Spuyten Duyvil is again referred to.

The advisability of equipping passenger cars with platform gates should be considered, and locomotive engines should have mufflers on the safety valves and check valves which will not break off in case of collision. The block signals of the New York Central are referred to, and it is said to be the intention of the company to introduce interlocking between Albany and Buffalo as soon as possible, so that that part of the road shall be as completely equipped as the Hudson Division.

There are 47 street railroads in the state operated by overhead electric trolleys. The Board makes a long list of recommendations for the promotion of safety on electric and cable railroads, of which the substance is:

All cars should have four gates, only one of which should be open at a time, and open cars should have guards to make them equally safe. The Commissioners have made personal examination of fenders and say that the best obtainable form should be adopted, awaiting for a perfect fender is unjustifiable. At the same time the cars should be operated so carefully that the fender will never come into use. The speed of cars should not exceed four miles an hour while crossing streets. At junctions the car not having right of way should come to a full stop before fouling the other track. Inspectors sufficient to attain and preserve the best discipline should be employed. Cars should not be allowed to meet on street crossings. At congested points watchmen should be employed. Speeds should be reduced on curves where the view is obstructed The use of air-brakes, like those on the cable roads in New York City, should be considered. All applicants for positions as motor men should be subjected to a thorough examination; if satisfactory they should then be trained in the shop or power house: then put on a car with an instructor, and finally, if appointed, should first serve on lines of least travel. These requirements, properly interpreted, will necessitate the employment of first-class men. All cars on electric roads where the grade is over three per cent. should carry sand. Stops should be made only at crossings, except at designated stopping places where crossings are far apart. The propriety of stopping just before crossing a street, instead of just after, is discussed, but the Board is not yet ready to recommend such practice. The speed of street cars in suburban districts should not be over 12 miles an hour. In more populous localities the local authorities must regulate the speed. Professor Plymton, of Brooklyn, has said that nothing but a mechanical governor will probably limit the speed of electric cars, but the Commissioners evidently see the uselessness of this as a means of safety, and they recommend the use of an indicator in the car so that the motor-man and the passengers can tell at a glance how fast they are traveling. The law should compel these street cars to stop before crossing steam railroads unless interlocking signals are provided. The law should also require signboards where electric lines cross highways in suburban districts.

Under the head of elevated railroads the Commissioners remark that their recommendations concerning lights in passenger cars apply there with great force. The cars should be lighted by gas or electricity. Rapid transit in the city of New York is discussed, but the solution of the problem is not attempted. The Commissioners hope that the improved facilities of the surface roads will relieve the pressure on the elevated. Section 59 of the railroad law, which forbids the building of new roads without the consent of the Commission, is discussed, and it is intimated that the Board will not approve such applications except on strong evidence that the proposed road is needed. Projectors need not expect approval of their schemes unless they will state on oath that they intend to begin construction at an early date. The section of the railroad law which permits a route to be changed without the approval of the Board is too loose and ought to be changed.

## King's Hopper Bottom Gondola.

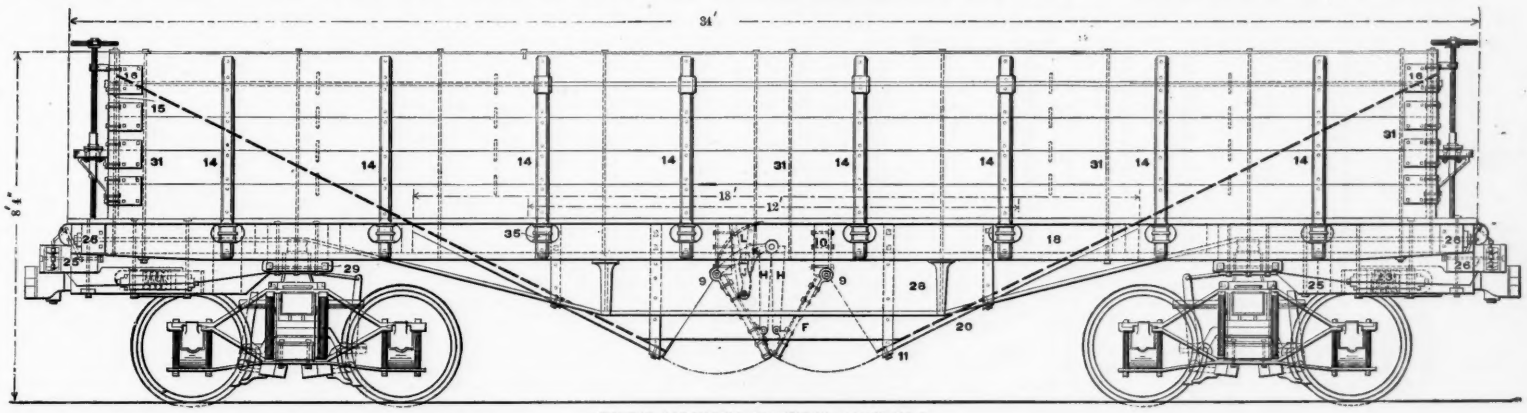
Herewith is given an elevation of the standard coal car of the Pennsylvania Coal Company, which does not differ materially from other cars except in the construction and mechanism of the doors of the hopper. The framing of the car is the same except the introduction of two cross-timbers 4 × 10 in. near the center, to which the drop doors are bolted.

The advantages of this style of door over the usual drop-bottom door are best shown by first giving the disadvantages and faults of the old door. First, if the latter be left open it hangs too low, or the hopper must be kept high above the ties; secondly, all four chains of the doors will seldom wind evenly on the chain shaft so as to draw the doors closely together, leaving spaces for coal to drop out in transit; thirdly, the doors freeze and cannot be readily opened, or the doors are closed in warmer weather and a cold snap contracts the chains and they break.

Mr. S. D. King, of Pittston, Pa., in his patented door has sought to overcome these difficulties, first by placing his hinges close up under the sills, and instead of having the doors swing down toward the track they swing out horizontally away from the hopper and are no nearer the track when open than when closed. By this hanging the hopper may be built lower, thus getting a greater car capacity and a steeper incline for the bottom. The doors being nearly vertical do not carry so great a load and are not required, therefore, to resist so great a pressure or to be so strong and heavy. Fully as large an opening is obtained and the doors will allow the largest lumps to pass.

By an ingenious device, consisting of a system of levers, he can bring the greatest pressure upon the doors in those positions where great force is needed. A reference to the figure will show this system of levers. It consists of a bracket (*L*) bolted to both sides of the car, which carries at its lower end a 2-in. shaft, on each end of which a 3-in. square head is forged. This shaft runs across the car transverse to the track and has at its middle point the arm (*J*) rigidly attached, so that when the shaft is turned the arm (*J*) is revolved up or down. The arm (*J*) is jointed at its upper end to the middle of the lever (*K*), one end of which is jointed to the arms (*H* and *H*) at the toggle joint. When the shaft is turned to the right and down, the arm throws the lever arm (*K*) bodily to the right, and the right-hand end down, while the left-hand end of lever slides along the quadrant guide (9 to *L*). As the right-hand end descends it carries the toggle joint or hinged struts down and permits the doors to drop to a perpendicular position; by which time the left end of the lever arm will have left the circular guide and the lever arm assumed a nearly vertical position.

The angle between the struts (*H*, *H*) will have become much greater and the arm (*J*) nearly horizontal. Any further turn of the shaft and arm to the right will increase the downward motion of the lever (*K*) and widen the angle between the struts, which as it increases becomes more and more powerful to close the doors. When the doors are closed tightly the hinge of the two struts (*H*, *H*) is slightly below a straight horizontal line between their attachments to the doors, and the arm (*J*) and the lever (*K*) are in nearly a straight line from the shaft to the joint between the two struts (*H*. *H*). If the doors stick or are frozen, a moderate power applied by a wrench to the head of the shaft at the side of the car yields a thousand-fold pull on the doors, which must come open. For by the combination of two systems of toggle joints one between the arm (*J*) and the lever (*K*), and the other between the two struts (*H*, *H*), both of which are nearly in a straight line, the power of the wrench is multiplied indefinitely. Once started the weight and lateral pressure of the coal do the rest and the system of levers are forced into the position shown in the cut, between the center sills of the car, in which position they will remain until the shaft is turned slightly to the right, when the doors are closed automatically by their own weight. This mechanism is certainly very ingenious and best understood from a working model, which the patentee takes pleasure in showing to parties interested. Its adaptation to this particular problem is unique in the broadest sense.




KING'S HOPPER BOTTOM GONDOLA.

The lever arm (*K*) is of malleable iron, and is 3 × 1 in. at right or lower end and 2 × 1 in. at the end that travels over the circular guide, which guide is ⅜ × 8 in plate bent on and screwed to a wood form.

The car, as illustrated, is 34 ft. long, with 4-ft. sides, and carries 60,000 lbs. of coal, which with the one hopper can be unloaded as easily and quickly as if it had two hoppers of the usual pattern.

Some 500 cars have been built after this plan and are in constant heavy service. They have been in use for several years, so that their experimental stage may be assumed to be past. The best of satisfaction is reported from them.

## Railroad Building with Reference to Economy in Operating.*

In the building of railroads the civil engineer is needed in three reasonably distinct capacities. . . . It is necessary, thirdly, that the railroad as a whole, and that the various parts of it, shall be arranged and constructed in such fashion as to lead to convenient, safe and economical operation. The civil engineer for this work must consider not only economy in first cost, but also, and in connection with it, economy in daily, monthly or yearly expense in conducting traffic. . . . The work of the civil engineer in this direction has been, and perhaps now is, less perfectly understood, but is, in the opinion of the writer, that requiring the highest order of ability, and in which the greatest opportunities for saving or waste occur. It is for this reason that this paper is to deal especially with this peculiar function of the engineer.

In locating a line of railroad the ideal line is a line straight and of uniform grade between the terminal points. If deviations from the ideal line are made they ought to be made so far as it appears that economy will result from such deviation. The resulting economy must depend in part upon the cost of construction, but must also be based upon a full consideration of the cost of operating the railroad. . . . An increase of distance, of the amount of curvature, or of grade, will occasion a disadvantage sufficient to justify an appreciable expenditure to avoid it. It is further true that an increase of "rise and fall" is attended with a similar disadvantage. Wherever adverse grades occur in passing from a higher to a lower point on a railroad, the "rise and fall" is the amount of rise in vertical feet of all such adverse grades.

It has been recognized for very many years, by at least a few engineers, that some allowance should be made in favor of a straight and level line, and that certain methods of procedure should be prescribed to determine what that allowance should be. As early as 1838 the subject was called to the attention of English engineers. Since then, from time to time, methods differing in detail among themselves have been proposed by engineers in Great Britain and on the Continent. The effect of curvature and of grade has been the only point investigated by foreign engineers, so far as the writer knows. A common method of procedure has been to find the "virtual length" of each line under consideration, and make an allowance in favor of the line having the shortest "virtual length." . . .

The treatment of the question in all the methods laid down, or in the formulas given, seems to the writer to be inadequate. There seems to be no recognition of the fact that certain parts of the expense in operating are independent of the mechanical work done by the locomotive, and of those dependent many are not doubled when the work of the locomotive is doubled; there is therefore no recognition whatever of the fact, which is certainly true, that the addition of a mile to the length of an operating division does not add to the expense an amount equal to the average cost of running a train one mile. American engineers now investigate the effect of distance, curvature, rise and fall, and grade upon the general principles laid down by Wellington in his "Economic Theory of Railway Location." The method adopte is, in brief, to consider each detail of operating expense, and determine, as wisely as we may, the ef-

* Extracts from a paper by C. Frank Allen, Member Am. Soc. Civil Engineers, Associate Professor of Railroad Engineering Mass. Inst. of Technology; read before the New England Railroad Club, Jan. 10, 1894.

fect of curvature, of grade, of rise and fall, or of increase of distance, upon that one item. The summation gives the total effect.

On most railroads it is known how much it costs to run a train one mile, and how much is to be assigned to the special items going to make up the operating expense. The statistics of the United States Census for 1890 show details of expense for the average of the United States as follows:

| | Per cent. | |
|---|---|---|
| Fuel for locomotives | 9.31 | |
| Water supply | .68 | |
| Oil and waste | 1.06 | |
| Repairs of locomotives | 6.19 | |
| Total engine | | 17.24 |
| Repairs, passenger cars | 2.99 | |
| Repairs, freight cars | 6.40 | |
| Passenger car mileage | .23 | |
| Freight car mileage | 2.21 | |
| Total cars | | 11.83 |
| Engine service wages | 7.72 | |
| Train service, passenger | 2.83 | |
| Train service, freight | 5.64 | |
| Train supplies, passenger | .33 | |
| Train supplies, freight | .36 | |
| Total train wages and supplies | | 16.90 |
| Total train expenses | | 45.97 |
| Repairs, road and track | 11.23 | |
| Renewals of rails | 4.89 | |
| Renewals of ties | 3.04 | |
| Repairs of bridges | 2.55 | |
| Repairs of buildings | 2.17 | |
| Repairs of fences, crossings, etc | .42 | |
| Total maintenance of way | | 24.30 |
| Total transportation expenses | | 70.27 |
| Loss and damage, freight | .28 | |
| Loss and damage, property and cattle | .31 | |
| Loss and damages, passengers | .39 | |
| Total loss and damages | | .98 |
| Agents and station service | 10.42 | |
| Station supplies | .81 | |
| Telegraph | 1.01 | |
| Taxes | 3.77 | |
| General officers and clerks | 3.46 | |
| Legal | .70 | |
| Insurance | .26 | |
| Stationery and printing | .76 | |
| Agencies and advertising | 1.34 | |
| Contingent and miscellaneous | 6.22 | 29.73 |
| Grand total | | 100.00 |

*Distance.*—How much can we profitably spend to avoid an increase in the length of line, so that an operating division may be kept at 100 miles in length, rather than increased to 101 miles? What will be the cost of one additional mile? Looking critically at the matter, it appears that very few of these items would be, for an extra mile, increased exactly in proportion to the distance. For instance, fuel is consumed in stopping and starting, in banking fires; even in standing still heat is radiated. So that altogether the increase for fuel on an extra mile will be probably only 67 per cent. of that consumed on the average. Engine and car repairs, in a similar way, are not all occasioned by running on the open line. There are various items entering into the average cost; the effect of age, of stopping and starting, of making up trains, of grades and curvature, will all enter into the cost and as a result 35 or 40 per cent. only will be found to properly apply in the case of an extra mile. Some items are practically unaffected by a slight increase in length of line; as the station, general and terminal expenses, and some others. Train wages will or will not enter into the cost, dependent upon whether the wages are paid on a mileage basis or by the day or trip. Car mileage will increase directly with the distance, or will increase 100 per cent., and perhaps the same is true of repairs of roadbed and track, and renewals of rails and ties.

Each item is investigated in this way, and summing up the effects it appears that when the average cost of a train-mile is $1, the cost of an extra train-mile is not $1, but perhaps 35 cents. For any other cost of train-mile the result would be in proportion; for instance, for a train-mile cost of 80 cents, the increase would be 28 cents instead of 35 cents.

The more trains there are running over the line, the more expense of hauling them over this extra mile. For a daily train each way (say No. 1 out and No. 2 in), we should have in a year 730 extra train-miles; at 28 cents per train-mile, this would amount in a year to $204.40. Again, in order to take care of this $204.40 per year, we may consider that we set aside a sum of money which at interest will produce this sum. At 5 per cent. this capitalized sum will amount to $4,088. Then this $4,088 is the sum which we can afford to spend in order to save one mile of distance, if we have one train only each way daily. If we have ten trains each way daily, we can afford to spend ten times as much, or $40,880, in order to save a mile of additional distance. For 25 trains each way, we can expend $102,200 to save a mile, or $19.36 to save even a foot of distance. This expenditure is justified, it should be borne in mind, in order to save in operating expense.

Where a saving of five or ten miles is in question, one additional station may be necessary, and certain items will then enter in which were not considered for one mile or less. So that for ten miles we must use a slightly greater value per mile; it is hardly necessary to follow this out in full.

*Curvature.*—It costs something extra to haul a train around any curve. . . . Engineers have found by experience how much power it takes to haul a train around a given curve. The best information we have on this point is to the effect that a 1-deg. curve increases the resistance by 1 lb. per ton; a 2-deg. curve by 2 lbs., and so on in direct proportion. If an engine is pulling its full trainload at a slow speed on a maximum grade, it is evident that on reaching a curve additional resistance is encountered, which is liable to stall the train. It is found that by lowering the grade around any curve which occurs on maximum grade, it is possible to make the resistance sensibly equal, whether on tangent or on curve. Just how much the grade shall be lowered in any case is determined by experience. . . .

If train resistance on a tangent is taken as 6 lbs. per ton, and on curves as 1 lb. per ton extra for a 1-deg. curve, then the resistance on a 6-deg. curve will be just double that on a tangent, and it requires double the power to haul a train over a mile of 6-deg. curve (317 deg. in all) that it does over a mile of tangent. We have seen how to find the increase of cost due to the extra mile of distance, and in a similar way we can find the increase of cost due to 317 deg. of curvature. We found that in doubling the resistance by adding a mile of distance, we did not double the cost of a train-mile. In a similar way, doubling the resistance by means of 317 deg. of curvature, we do not double the cost of a train-mile.

Taking the itemized cost of a train-mile as before and investigating the effect upon each item, we find in this way that it is reasonable to assume that the increased resistance will increase the item of fuel 50 per cent. The item of engine repairs would probably be increased by 67 per cent. for this large amount of curvature. Repairs of cars would show about 60 per cent. The wear of rails on a 6-deg. curve would be more than double that on a tangent, and for this item it seems proper to allow 150 per cent. It seems hardly necessary here to specify or tabulate all the items, many of which show no increase. Suffice it to say that the total increase of expense due to 317 deg. of curvature will amount to about 30 cents when the average cost of a train-mile is $1, or 24 cents when the cost of a train-mile is 80 cents. In the latter case the cost of 1 deg. of curvature will be nearly 0.08 cent per train-mile, and the annual cost for one train each way 58.4 cents. At five per cent. interest, the capitalized sum will be $11.68. That is, on a road where there is one train each way daily, we can afford to spend $11.68 to save only 1 deg. of curvature, that is to save 1.360 part of a circle. With ten trains a day we can spend $116.80, and with 25 trains a day we can safely spend $292, to save even 1 deg. of curvature. In turning a right angle, or 90 deg., the figures would show for one train a day $1,051.20; for 10 trains $10,512, or for 25 trains $26,280.

*Rise and Fall.*—There can be little doubt that in passing from one point to another it costs more to haul a train if a succession of summits has to be passed over than if there is a continuous rise or a continuous fall from one terminus to another. It is, perhaps, less easy to investigate this matter than the cases of distance and curvature, but reasonably satisfactory conclusions may be reached here. It may readily be shown that it takes about the same power to raise a train vertically 26 ft. as to haul it a mile on a level. We then seek to find how much the cost of a train-mile will be increased if the train be raised through a height of 26 ft. and then lowered again; or if, in other words, there occur in the mile 26 ft. of rise and fall. It will make a difference in the cost whether, in running down hill, brakes need to be used (1) constantly, (2) occasionally or (3) not at all.

Taking the medium case, where steam is occasionally shut off and brakes occasionally set, in running down hill: investigating in detail as before, we shall find that for 26 ft. of rise and fall, we shall increase the cost about 3¾ cents when the average cost of a train-mile is $1, or about three cents for a train-mile cost of 80 cents. The cost of one foot of rise and fall will be $\frac{3}{26}$ cent, and this for one daily train each way will in a year amount to 84 cents, or, capitalized at five per cent., we can afford to spend $16.80 to save one foot of rise and fall; $168 for 10 trains, and for 25 trains a day we can profitably spend $420 to save only one foot of rise and fall. These figures reached in the case of distance, of curvature, and of rise and fall, may seem large; it must be remembered that they result from a slight increase in the cost of running each train. Anything which would cause an increase in the number of trains would in all probability cause even a greater yearly expense, and would justify even a larger expenditure, if by making it the increase in the number of trains could be avoided.

*Maximum Grade.*—. . . With a given traffic to be carried over the line, an increase in the grade means an increase in the number of trains, unless you increase the weight of locomotive, and this in general may be considered out of the question. You are probably using the heaviest locomotive practicable in any case. It will be sufficient for our present purpose, for us to confine our consideration to the case where an increase of grade means an increase in the number of trains, which may be considered the usual case.

In investigating the effect of grade, we proceed to find the increase of cost due to doubling the resistance, but in this case doubling the resistance by doubling the number of trains. Without here stating the items in detail, it is sufficient to say that an investigation similar to the others is again made in this case, and it is found that the train-mile cost for an additional train is about 50 cents when the average on the road is $1, or 40 cents for a train-mile cost of 80 cents. Now, if we wish to compare two given grades, it is clear that if we know what allowance to make for train resistance, and have given the weight and proportions of the locomotives used, we can without difficulty calculate the weight of train that can be hauled on each of these grades. A comparison of the train-weights on the two grades will show by what per cent. the number of trains must be increased on the steeper grade in carrying a given traffic. If the increase in the number of trains is 20 per cent., then the increase in cost will be 20 per cent. of what we have found as the proper figure for doubling the number of trains. It must be further understood that when you increase the number of trains, each additional train must run over *every mile of the division*, and if the division be 100 miles long each additional train will cost, using our previous figures, 40 cents for each mile, $40 for the division, and this for each train. It will not be profitable for us to follow out with figures all the steps in this process, but it is evident that the expense of increasing the rate of grade is likely to be very large comparatively. It will be profitable for us to take at least one example, so that we may know about how much the disadvantage of steeper grades really is in dollars and cents.

Calculations made for an average consolidation engine show that on an operating division 100 miles long, a difference in grade between 0.70 per 100, or 37 ft. per mile, and 1.00 per 100, or 53 ft. per mile, for one daily train each way, at 80 cents per train-mile, will justify an expenditure of $8,000 per year; capitalizing at five per cent., we find that we may profitably expend $160,000 of capital rather than make the maximum grade of the division 53 ft. per mile, if by this expenditure we can keep the grade at 37 ft. per mile. For 10 daily trains each day we can spend $1,600,000, and for 25 trains per day $4,000,000, to secure the lower grade. In figuring the number of trains, all trains running should not be included, but only those (mostly freight) whose length would be affected by the difference in grade.

In comparing one line with another, the length, total degrees of curvature, and total rise and fall are found for each line, and the difference is found for or against one of these lines; the difference in grade is also noted. To the cost of construction for this line are added or subtracted, as the case may be, the allowances for the differences in distance, curvature, grade, and rise and fall. The line which is thus shown to be the cheapest is selected.

No mention has been made of the necessity for locating so as to secure business, simply for the reason that it is not the purpose of this paper to discuss that question, which is perhaps of no less importance than that of operating expense.

The figures shown for grade seem large, and they are large, but the writer believes them to be substantially correct, and they go to prove the proposition stated early in this paper, namely, that the work of the civil engineer in designing work for economical operation is of the highest order of importance. The opportunity for waste is so great that it seems wicked that a considerable portion of the earlier work in railroad location should have been done without proper appreciation of such questions, or sometimes in disregard of them.

It is desirable that attention should be called to the fact that the sum that can profitably be expended in any of these cases depends on the number of trains. . . . The figures we have given will further convince us that many earlier lines were properly located for the conditions of the meager traffic which then existed, but have since become unsuited to the larger traffic in later times carried over their line. We can undestand why it is that many of the older and more important trunk lines can afford to expend enormous sums of money in improvement of line and of grade. It is easy also to appreciate, in the law regulating the abolition of grade crossings, the justice of the provision that no grade of railroad shall be changed except by consent of the directors, or rather as amended, without the consent of the railroad commissioners. . . .

While the matter of location is a striking instance, it is not the only instance of importance in railroad building. That this is true is instanced by a report of P. H. Dudley. Following certain experiments on train resistance and certain investigations as to coal consumption, he announced that if the train resistance on the L. S. & M. S. could be reduced one-quarter, the saving to the road in operating expense, based on the amount of traffic in 1893, would amount to more than $750,000. That a saving of 25 per cent. was then possible for many roads, was evidenced by the fact that comparing two roads entering Cleveland at that time, one with iron rails and low joints, the other with steel rails well laid and ballasted, a difference in train resistance of as much as 57 per cent. was found. The moral to be derived from his statement and showing is that the engineer who figures only upon the comparative cost of heavy and of light rails for a series of years stops far short of his whole duty. The smaller train resistance and corresponding smaller operating expense in favor of the heavier rail are a consideration of definite importance. . .

In another direction, too, railroad building with reference to economy in operating is a necessity not by any means fully appreciated. This is in the design or arrangement of yards and stations. Many railroad men assert unequivocally that a well designed yard in this country is a noteworthy exception. The writer is not prepared at this time to present any figures for the comparative economy of different methods of switching, but the opinion is confidently advanced that, in the development and improvement of railroads in the near future, the suitable arrangement of yards is a point to which considerable attention should be devoted, and with a view to calling upon the engineer for the exercise of his abilities in securing economy in operating.

In another direction, the design of structures for the handling of coal, opportunity for building with reference to economy in operating is evident. In the proceedings of the Master Mechanics' Association for 1887, the report of a committee shows that the handling of coal by ordinary platform costs 20 cents per ton; by the Kerr or Clifton chutes about 7 cents; while by using a high trestle and hopper bottom cars the cost may be reduced to 4 cents a ton. The chute which gives the greatest economy of operation costs the most money. Where a small amount of coal is to be handled, the expensive plant will not be justified; where a large amount of coal is to be handled, it would prove ruinous to pay the higher cost per ton for handling.

It is not the purpose of this paper to multiply examples. It is enough that the principle to be observed should be established. The most important points to which attention should be given are (1) location, (2) track surface, (3) yards. Beyond these, however, profits in railroading, if there are any, are made up nowadays largely of minor economies; to secure these, railroads must be designed and constructed with careful attention at every step to the securing of economy in operating. So impressed is the writer with the importance of this subject, that this paper has been prepared with a two-fold object. First, to call again the special attention of the civil engineer to the superior importance of this function of his work. Second, to strongly call the attention of railroad men in other departments to the economies which their engineers can and ought to secure them, and to urge them that they should demand from their engineers the exercise of their abilities in this direction. The writer urges that the civil engineer should be employed because it will be more expensive to operate the road if he be not employed, and the engineer must, by his works, justify his employment for this purpose. When the millennium is to this extent reached, the civil engineer will, by universal accord, occupy that post of honor which his real worth will then demand for him.

DISCUSSION.

Mr. JOHN W. MARDEN: I have been very much interested in Professor Allen's paper, and I think there are very many lessons which can be drawn from it by all of us. . . . I think that Professor Allen is entitled to the thanks of our Association, and if in order, I move that a vote of thanks be given him for his valuable paper. The motion was unanimously carried.

The PRESIDENT: We have with us Mr. Turner, formerly engineer upon the Fitchburg road, and we shall be very much pleased to hear a few words from him upon this subject.

Mr. E. K. TURNER: The Fitchburg Railroad was the Massachusetts Railroad when it was started. At that time money was scarce and difficult to get, and it was hard work to get enough to built a cheap road. It was built and used till about 1875, and at that time its location through the tunnel made it necessary to enlarge its facilities and change the road. For thirty years that road was used. To have put that road in proper shape for a large business when it was built would have increased the expense three millions. In thirty years it would have doubled enough times to give twenty-four millions. In 1875 we went to work to improve the road, getting it ready for new business, and from that time until 1885 about four million dollars was spent to put it into the shape it is now in. . . . I think so far as the grades are concerned now on that road, that they have been reduced from 60 and 70 ft. grades, coming east, to 47 ft. There were long gradients, and 47 ft. was the best we could get, and that we adopted as the ruling grade. They were grades up and down. There was an attempt made to reduce them to single long gradients, and in one case I kept an account of the number of cars handled by a locomotive, and found that this change of gradients resulted in saving about 13 per cent. . . .

There is one thing that occurred to me that I think might be done at a comparatively small expense on many of our railroads that would produce a large measure of economy, and that is providing better facilities

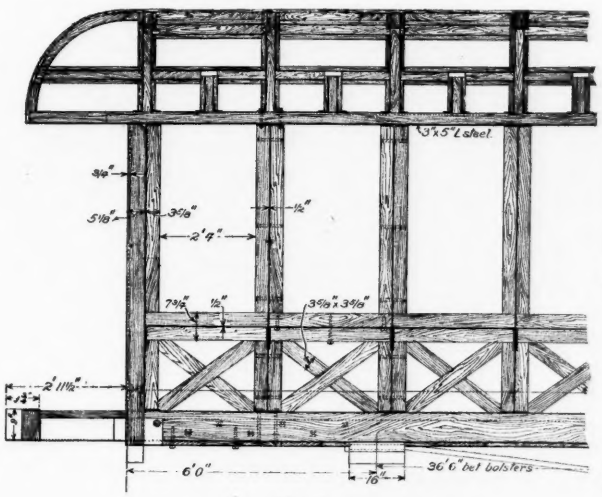



Fig. 1.

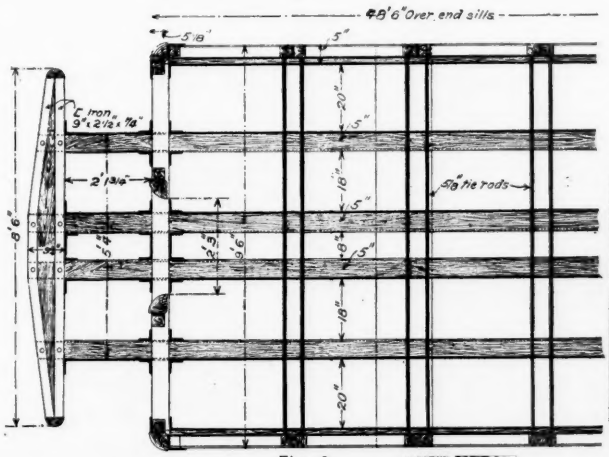



Fig. 2.

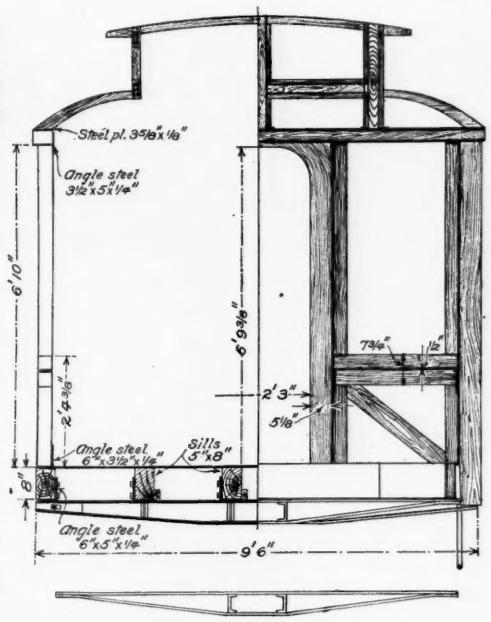



Fig. 3—End Elevation.

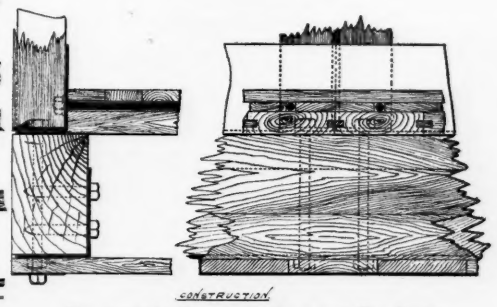


Fig. 4—Side Elevation, Floor and Tie Rods.

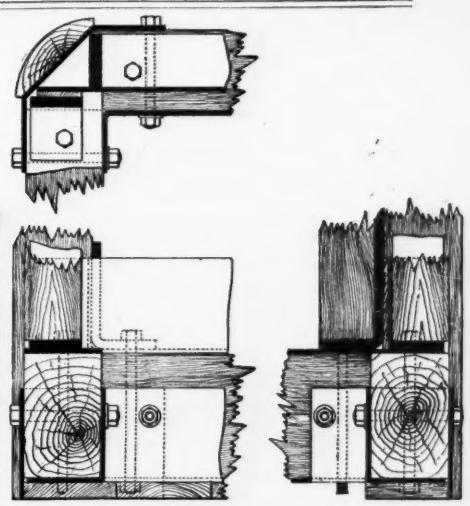


Fig. 5—Corner of Underframing.

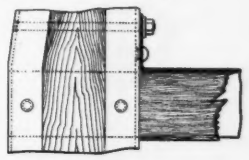


Fig. 6.

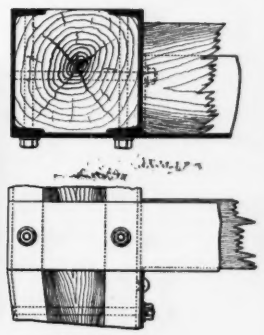


Fig. 7.

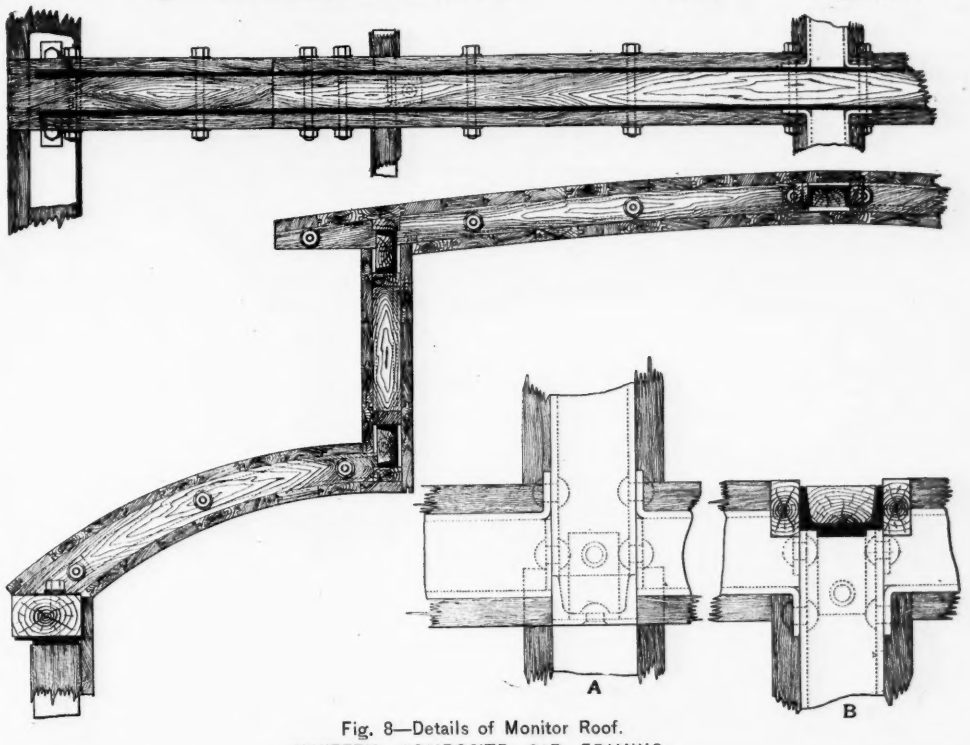



Fig. 8—Details of Monitor Roof.

for sorting cars. I do not think there are five per cent. of the yards in the United States where trains are made up and cars shifted between the trains and sorted out that were ever designed with any idea of the service that they were to be put to. It was simply to get land enough, and on this land place a large number of tracks sufficient to furnish storage capacity for the cars that might come to that particular yard. Now, there is no doubt yards can be designed where the sorting of the cars could be done very much more economically than it can in the usual way. The ordinary way is to hitch on a string of cars and drill them back and forth, perhaps making them into long trains of 40 or 60 cars, and giving as many movements to that entire train as there are cars in the train. This to the mechanical department means something. I assume, and I think my friends here who have charge of the maintenance of cars on our railroads will agree with me, that a very large percentage of the repairs of cars—I am now speaking of freight cars—are brought about by the handling of these cars in the yards. If we could have proper yards for this service it would largely reduce the "bad order" car list on every road in the United States, I believe.

## Jewett's Patent Composite Car Framing.

As supplementing the recent adoption of the composite car construction by one of our large railroad systems we give illustrations showing the extension of a like system to other parts of the car. The size and general dimensions have been taken from a Baltimore & Ohio passenger car, but the arrangement and details are by the patentee, Mr. Luther K. Jewett, of Boston, Mass.

Reference to figs. 1 and 2 will show the underframing to consist of six 5 × 8 in. yellow pine sills extending the entire length of the car, the center and intermediate sills ending at the platform end sill. The end sill is composed of a steel plate placed above the sills and a queen-post truss placed beneath the sills with distance blocks between, the whole being strongly bolted and riveted together. The sizes and dimensions of the parts of the underframing are shown in the diagram and need not be repeated. The belt rail and posts, fig. 1, are made up of two pieces 3⅝-in. square, bolted, screwed or riveted to 3¼ × ¼ or ⅜-in. steel plates. The ends of these plates are bent at right angles to their length and fastened to the abutting timbers, or bolted by ⅝-in. rivets or bolts. At the junction of the end and side sills is a 7⅛ × ¼-in. steel plate fastened by ⅝-in. bolts that passes through the sills and angle backing, fig. 5. Two 3¼ × ⅜-in. steel plates are also bolted to the sills and corner posts by ⅝-in. bolts. All these are shown in the drawings, together with their dimensions.

Attention is called to the end sill truss made of two plates riveted together, and also to the steel angles of the sills, placed under the end sill as shown in fig. 3. The floor as shown in fig. 4 is made up of three layers, the lower one of 1⅛-in. spliced spruce, the middle one of ¾-in. spruce and the top one of ¾-in. yellow pine. The two lower courses are laid across the car and the top course is laid lengthwise of the car. Thirty ⅝-in. tie rods, figs. 2 and 4, are bedded in this floor and pass through the angle steel of the window posts. The platform end sill or buffer beam is shown in fig. 7, and consists of channels with wood between, which are bolted to the steel angle backing of the sills. On top of the end sills are ¼-in. steel plates bolted through and and through to the top members of the end sill truss. The needle beams are built up of two 9 × 2¼ × ¼-in. channels, which receive the truss rod supports. These channels are held by two ⅝-in. bolts fastened to the window post plate and to the sill.

Fig. 8 shows the roof composed of channels with strips of wood on each side, or, as in the case of the ridge pole, a channel filled with wood and strongly bolted together. The details are so plainly shown in the cuts as to need no further description. Two plates of steel, 10 in. wide and ⅛ in. thick, riveted together, with four intermediate and two end posts for filling pieces, constitute the car body bolster, shown in fig. 3. Holes are cored in the end posts or castings to receive the truss rods and filling pieces. The various other details, together with their dimensions, are given in the drawings.

The method of erection is described as follows: The stock is all cut to the required size, holes punched or bored in each piece before the erection is begun. The sill angles and bolster are first riveted together and the wooden sills next laid, after which the angle irons on the tops of the sills are put in place. Next comes the lowest floor course, then the tie rods followed by the two upper courses of the floor. The steel window posts are next put in position and bolted to the sills, after which the belt rail plates are securely fastened to the window post steel. Next follows the steel plate on top of the windows, and the bracing and other woodwork are put in when the side framing is completed; then follows the roof, and the construction of the car is practically completed.

Some further features of the car follow: All pin bolts and lag screws are five-eighths of an inch; all window posts, belt railing and bracing is 3⅝ square spruce and the sills are all 5 × 8 in. yellow pine; all steel angles are 6 × 5 × ¼ in. or 5 × 3½ × ¼ in. and the plates are all 3⅝ × ⅜. By the adoption of these dimensions there is

no waste in stock, as everything is made in duplicate and there is no chance of getting any piece of stock wrong end first in putting the frame together. All of the window posts' pieces are of the same size and dimensions and the same may be said of the belt rails and X bracing. To crush the car it will be necessary to break six yellow pine sills 5 × 8 in. and eight steel angles 6 × 5 × ¼ in. as well as the flooring and roof construction.

## New Rail Connection for Track-Circuit Signals.

We publish herewith a new bond wire devised by Mr. Arthur H. Johnson, for electric track circuits, as used on electric railroads and in railroad signaling. Bond wires are used at every rail joint in a track circuit to

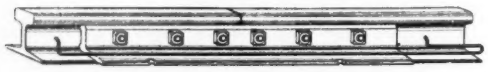


Fig. 1.

reduce the resistance to the passage of an electric current offered by the scaly surface of the steel joint. The ends of the wires are usually joined to the rail by means of rivets or wedges.

It will be noticed that in this design no extra pieces are necessary, the joint of the wire with the rail being

Fig. 2. Fig. 3. Fig. 4.

made direct. One end of the bond wire is expanded at the works. A taper hole is made near the end of each rail, and the taper end of the wire is driven home in one end of each rail, as shown in fig. 4. The other end is then passed through the other hole, as shown in fig. 2, and is expanded by means of a small steel die, as shown at fig. 3. This end of the wire is then driven home, as shown in place at fig. 1. Fig. 5 shows a way of locking the joint by a slight distortion of the wire. Fig. 6 shows the proportion of the taper end on a larger scale.

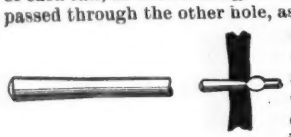


Fig. 6. Fig. 5.

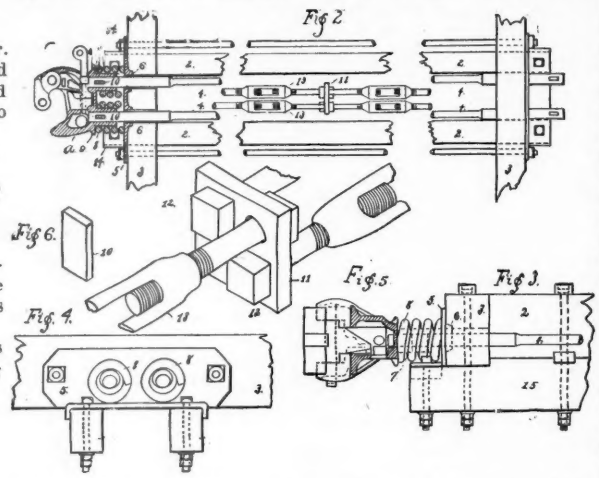
It is claimed that this joint offers less resistance than those at present in use, owing to the smaller number of parts; that it is more durable, and that a smaller hole is required in proportion to the size of the wire. A patent has been applied for.

## The Trojan Coupler Company's Draft Rigging.

A new draft rigging which is made by the Trojan Car Coupler Co. is shown in the engravings. It is attached at the height of the end sill of the car to meet the modern idea of lower cars and same height of coupler. The coupler head is carried on a 4½-in. projection of the draft timbers on a strap carrier iron, (see fig. 1). It serves as a support and relieves the draft rod from downward strains. The distance between the ends of cars is preserved the same as the M. C. B. standard, and the form of coupler used is the well-known Trojan lock, the parts of which, except the drawhead itself, are the same as in the ordinary form of Trojan coupler. The entire attachment consists of 47 parts and weighs 1,050 lbs., which is a noticeable saving in number of parts, weight and cost over that of most draw gears. The coupler is best described by reference to the figures herewith presented. Fig. 2 represents the under plan of the car, with the new draft apparatus attached. The right hand end shows the continuous draft rods without the coupler attached, and at the left hand end the coupler is attached. The draft rods pass through the end sills through 2¾ in. holes, and the draft heads are connected thereto as shown in figs. 2 and 5. The end sill is sheathed with a buffer plate of steel and two springs, 8, are interposed between it and the drawheads. The ends of the draw rods, 4, are fastened to the drawhead by steel keys, 10, which pass through the drawheads and corresponding openings in the rods. The other ends of each pair of draft rods are connected underneath the car body to the connecting rods by being passed through the diagonally opposite corners of a vertical plate, 11, and secured thereto as shown in figs. 2 and 5. This arrangement resists any tensiled strain, but yields freely to any thrust on account of compression. The attachment of the draft rigging does not necessitate any change in the car framing except the boring of two holes, 2¾ in. diameter, through each end sill and the bolting of a steel buffer plate as shown, which takes the place of the usual deadwood. The following advantages are claimed, namely: That the stress from impact and tension are received upon the part of the car best able to resist them; that with two springs the stress is distributed over twice as much surface as in the ordinary arrangement; that the springs must be fully compressed before the underframing of the car can be crushed; that the floor of the cars is 7 in. lower, and gives easy riding around curves and over rough track; that the height of the car body may be increased without adding to the



Fig 1.




height of the car, and that a lower car floor facilitates loading and unloading. The drawhead is made unusually strong, and it may be readily attached or detached without opening the car. The usual amount of lateral and vertical motion is provided for.

Twenty freight cars have been equipped with a similar less perfect form of draw gear, and the first year's service has been very satisfactory. The Trojan Car Coupler Co., of Troy, N. Y., or Mr. W. V. S. Thorne, Superintendent Eastern Ry. of Minnesota, West Superior, Wis. will give any further particulars.

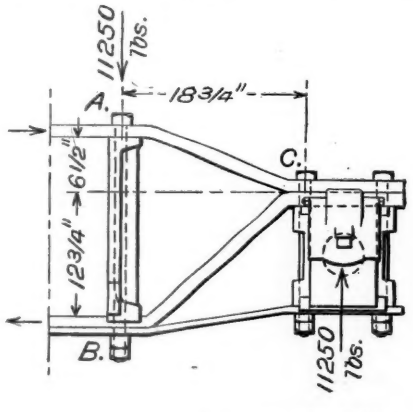
## Sizes of Arch Bars.

In our issue of July 21 last there appeared illustrations and a description of a 60,000 lb. box car of the Cleveland, Cincinnati, Chicago & St. Louis Railway. Concerning one detail of this car a correspondent wrote as follows:

A common fault I have observed in cars where the proportions are guessed at rather than figured out occurs in the arch bars of this car. The top and bottom arch bars are each 1¼ × 4 in. As the top bar is in compression and the bottom one in tension, and the values of wrought iron for tension are much greater than for compression, it follows that if the top bar is strong enough, the bottom one is twice as strong as is necessary nearly, and the saving which correct proportions would make on 1,000 cars would be considerable. * * *

The load of 60,000 lbs. and the weight of the car, about 30,000 lbs., will give a load upon each pair of arch bars of 22,500 lbs., or 11,250 lbs. upon each journal. It will be safe to assume that this is carried by the upper and lower arch bars, the tie bar not being intended to carry any of the load. If this load of 11.250 is resolved, by the simple principle of the parallelogram of forces, into the directions of the bars, it will give a compression of 11,680 lbs. in the upper bar and a tension of 13,250 in the lower bar.

If the upper arch bar be considered a short block its compressive strength is equal to its cross section mul-




$$Breaking\ strength = \frac{Area \times f}{1 + \frac{l^2}{r^2 \cdot a}} = \frac{5 \times 90{,}000}{1 + \frac{20 \times 20'}{.13 \times 36000}}$$

tiplied by the compressive strength of wrought iron, which, if taken at a low figure, say 30,000 lbs. per sq. in. (in order to favor our correspondent), will give a compressive strength of five times 30,000, equal to 150,000. As the maximum stress in this bar for a uniformly loaded car is 11,680, the bar has a factor of safety of 12.8. If the upper arch bar between the bolster and oilbox be treated as a column, its breaking strength by Gordon's formula (p. 439, Trautwine's Handbook) is 138,200, giving a factor of safety of 11.8 for the upper bar.

The tensile strength of a bar of iron 1¼ by 4 in., taking the strength per sq. in. as 50,000 lbs., is 250,000, which, divided by the load on the lower arch bar 13,250, gives a factor of safety of 18.8 much too large, as our correspondent suggests. If it were made of a size giving the same coefficient as the upper bar (11.8) it might be about ¾ × 4 in. which would save on 1,000 cars about 90 tons of iron, as our correspondent concludes.

But our correspondent must not believe that all the Master Car Builders in the country are guilty of such gross extravagance or are so ignorant. He should look further and see if there are not other conditions to consider, perhaps some things that have escaped his economical eye. There are bolt holes in that lower arch bar, as there are also in the upper bar, but a bolt hole in a compression member does not weaken it as it will in a tension number. An arch bar in compression will bear against the bolt and against the metal upon either side of the bolt and thus have the strength of the full cross-section area; but an arch bar in tension has only the metal on each side of the bolt to resist fracture. If then from the 5-in. cross-section of the lower bar we deduct the bolt hole (1¼ × 1$\frac{5}{16}$), 1.64 in. area, we shall have a cross-section of 3.36 in., which give a tensile strength of 167,000 lbs., and a factor of safety of about 12.6, as against 12 for the upper bar. This is as near as can be desired by the most economical. The factor of safety 12 is usually employed, and it would be dangerous to risk a smaller one. The 60,000 lbs. loading is frequently exceeded; it may be so placed in the car that one truck has to carry much more than the other. A truck is subject to shocks and blows such as no simple statical structure ever has to withstand. If one will imagine the burden upon a truck when it is derailed and goes pounding along from tie to tie, he will hardly dare build with a less factor of safety than 12.

If a compression strength of 40,000 lbs. per sq. in., which is employed in bridge work, were used the upper bar would have been found the stronger.

## The Air-Brake Situation.

Under the above title the Westinghouse Air-Brake Company has recently issued a pamphlet, which sums up some of the aspects and consequences of the recent Court decisions briefly and clearly. We abridge below some of the main points.

In 1883 all inventors and makers of automatic pneumatic brake apparatus were forced to the conclusion that no existing type of brake mechanism wholly operated by air could be used on long trains. Most inventors other than Mr. Westinghouse, perhaps all others, turned their attention to electro-pneumatic brakes. Of this last type several forms were presented and tried and proved successful, so far as test operation was concerned. The members of the committee appointed by the Master Car Builders' Association to conduct the tests and report on the best practical brake, after exhaustive investigation made a long and able report, recommending the use of electro-pneumatic brakes as being the only type that would be found practical for use on long trains. This shows that up to that time all concerned, except Mr. Westinghouse, had given up hope of a purely pneumatic practical brake. But Mr. Westinghouse devised an entirely new method in pneumatic brake operation by compelling each individual brake in the train to apply the next succeeding brake, and as this had not been done before, the discovery was a true invention, and in 1887 and 1888 patents were granted to Mr. Westinghouse covering all of the methods of construction of brake mechanism, operating on the principle of making one individual brake apply the succeeding one, so far as can now be determined from the decisions of the court and from the patent claims read in the light of those decisions.

All automatic air-brakes are applied upon a reduction of air pressure in the train pipe; and in the new invention, the triple valves so operated that upon a considerable reduction of pressure in the train pipe, at the front end of the train, through the engineer's valve, the first brake in the train would allow the air in the train pipe to escape into the brake cylinder and produce three useful effects, viz., a further reduction of train pipe pressure, so as to more quickly apply succeeding brakes; an increase of air pressure in the brake cylinder, and a saving in the air required to apply the brakes. Before the invention of this type of brake, a long train would be stopped fully before the brakes on the rear of the train would commence to apply. With the new type of brake in a train about three-eighths of a mile long, the time from the commencement of the application of the first brake in the train to the commencement of the application of the last brake is only two seconds, or practically the same as the velocity of sound, and some have argued that the new brakes are actuated by a pulsation similar to a sound wave rather than by a general reduction of pressure. This rapidity of action has led to the use of the term "quick action" in describing the new type of brake.

It is this invention that the Westinghouse Co. has been trying to protect in the United States Courts. So far as we know all of the makers and designers of quick action brakes which operate on the plan of one brake

applying another next succeeding, have granted without out discussion that Mr. Westinghouse was the true inventor of the new plan, but they have hoped to obtain the right to use their designs on technical grounds, claiming that the inventor did not protect his invention by suitable patents, and while they grant that he was entitled to ground claims and broad patents, yet they hold that he did not obtain them. It is pretty clear from the recent decision of the United States Court in New York that the patents of Mr. Westinghouse will be construed very broadly, and no one reading the claims would be led to believe that the claims are not fundamental. The language of the claims is broad enough, but infringers have held that the claims were broader and more fundamental than was warranted. In any case the first inventor in the new field of "quick action" brakes was Mr. Westinghouse, and he was therefore entitled to fundamental claims and to protection. Of course we cannot pass upon the technicalities of the case, and therefore this opinion is based solely on the fact that the claims are broad and fundamental, and that Mr. Westinghouse was the original inventor.

The United States Government grants a monopoly to an invention for 17 years. The Government does not demand that the inventor shall serve the public in any capacity in return for the legal monopoly, but has left the public service to be determined by the financial interest of the inventor, probably on the broad grounds that the most profit will be made when the inventor serves the public in the best way, and in most cases this is the practical result of such a legal monopoly.

The public is not always served as well by the holders of sweeping rights as it has been in this case, as it is not customary for manufacturers of patented articles to devote much time and money to the education of the public. Generally the users are left to their own wits to get the best good out of the devices which they purchase. The Westinghouse Company equipped a fifty-car train and sent it about the country with a corps of assistants and two locomotives to give exhibitions of the utility of air-brakes on long trains. This was done at great expense, and in an educational way nothing has been done since to so much increase useful knowledge of brakes. Large works have been built, and there has always been a capacity sufficient to supply brake equipments at once upon receipt of order, and at prices which have returned a much smaller profit than is usually obtained from the sale of patented devices where there is no strong competition. In fact, the percentage of profit is less than is often derived from the sale of staple and unpatented articles to railroad companies, and railroad companies could not manufacture, even if they had the right, the air-brake apparatus at the price at which they can buy it.

The Westinghouse company has always maintained a large corps of instructors subject to the call of railroad companies, and has furnished inspectors and instructors to some railroad companies for a period of several years without charge. It has given away many sets of experimental apparatus, and probably there is not a railroad company in this country that has ever made a reasonable request to the Westinghouse company that has not been granted without hesitation. Taking all this together with the expenses resulting from infringers, and bearing in mind the fact that the apparatus is always made as nearly perfect as it can be with the exercise of good mechanical skill, and, further, that the makers have not changed their devices so much that they have not always been kept interchangeable, it is reasonable to conclude that the public has not suffered from the monopoly.

The brake mechanism used on all cars in this country is practically a standard in dimension and type, and there is no such mixed state of affairs as is the case with car couplers, which might have been the result if the entire brake business had not been in the hands of a single corporation. As an example of what would result generally from a mixture of air-brake systems and indiscriminate manufacture, take the case of a stock car company, which, having recently put on nearly 2,000 sets of a new type of brake apparatus, has had to remove them all, not because they infringed the Westinghouse patents, but because they were wholly unfit for practical service. Brake mechanisms are complicated and a design is only proved to be practical after actual service, and railroads are not run for the purpose of inventing or devising or perfecting mechanical apparatus.

## Tests of Oils on Prussian Railroads.

The account which we give below of the specifications and tests of mineral oils in Prussia is taken from a recent number of *Dingler's Polytechnische Journal:*

In 1890 the different Prussian State railroads introduced a uniform specification for the supply of mineral lubricating oils. In this specification, the viscosity of the oils referred to was that of colza oil at temperatures varying from 68 deg. to 122 deg. F. (20 deg. to 50 deg. C.). It was soon found in practice that the relative viscosity varied considerably in oils from different districts, and in the specification issued this year the upper and lower limits of viscosity have been extended. At the same time colza oil has been abandoned as standard and distilled water at 68 deg. F. (20 deg. C.) substituted. The water is allowed to run through an Engler's viscosimeter at a carefully ascertained temperature, and the viscosity of the oil under examination is ascertained by allowing a portion of it to flow through the viscosimeter at the same temperature. The flashing point (specified is 320 deg. F. (160 deg. C.), and the specific gravity at 60 deg. F. (20 deg. C.) between 0.900 and 0.925. The oil must be free from water and mineral acid, and be completely soluble in light petroleum of a specific gravity of 0.67 to 0.70. It must contain no foreign substances, give no precipitate even when stored for a long time, and must not resinify or form a skin when exposed to the air in a thin layer.

The flashing point is tested by means of an open porcelain crucible heated upon a sand bath, and the resistance to cold by means of a special apparatus. The author points out that in testing Engler's viscosimeter it is of the greatest importance to use not only distilled water, but also oil as a check, because the adhesion of oil to the tube is so much greater than that of water that great difference might be found in using apparatus giving uniform results with water only.

The apparatus for testing the resistance to cold consists mainly of two parts; one for producing the standard pressure of a column of water 1,968 in. (50 millimeters) high, and the other for cooling the sample by means of a freezing mixture. The oil is placed in a U tube and immersed in a freezing mixture for an hour. It is then subjected to the pressure mentioned, and the oil must then rise 0.3937 in. (10 millimeters) in one of the limbs of the tube before the lapse of one minute. The freezing mixture consists of one part of baysalt and two parts of crushed ice, which will reduce the temperature to less than 5 deg. F. (—15 deg. C.). The author carried out a series of experiments with this apparatus which resulted in the detection of several possible sources of error. It is especially pointed out that any alteration in the diameter of the U tubes or irregularity in the curve will vitiate the results. The india-rubber connecting tubes must be of a diameter exactly equal to that of the tubes which they unite, and if any solid particles are visible in the oil the friction will be increased and the rise in the test tube correspondingly retarded. It is necessary to filter the oil before testing in order to obtain uniform results.

As regards the proportion of water, it is stated that 1.10 per cent. is sufficient to cause a thick mineral oil to spudder and froth when heated, and this test is recommended by the author. Mineral acids should be entirely absent; but organic acids of a very weak character are generally to be found, and the maximum is fixed at a 1.10 per cent.

The bulk of the railroad lubricating oil used in Germany is from Baku, and the cost in Hamburg about £1 per cwt. Of this amount 61 per cent. is import duty, 31 per cent. cost of transport, leaving only 8 per cent. as the value of the oil itself.

According to this the latest specifications of the Prussian State railroads require for mineral lubricating oils a specific gravity between 0.900 and 0.925, a flashing point not below 320 deg. F., a viscosity test, using distilled water, at 60 deg. F?, as a standard, and a cold test of 5 deg. F. The oil must be free from water, mineral acids and foreign substances, and completely soluble in light petroleum of a specific gravity of from 0.67 to 0.70. The flash test is made in an open porcelain cup.

A comparison of the above with the following synopsis of the specifications of a number of railroads in this country will show the difference between American and Prussian practice.

*Baltimore & Ohio.*—Freight Car Oil: From Oct. 1 to May 1, a flashing point above 200 deg. F., and a cold test below 15 deg. F. From May 1 to Oct. 1. a flashing point above 250 deg. F. Oil must show no sediment in 15 minutes when 5 cu. cent. are mixed with 100 cu. cent. of gasoline of 0.6511. It must contain not less than 10 per cent. of saponifiable animal oil.

*Philadelphia & Reading.*—Car Oil: Must not flash below 325 deg. F. when tested in an open vessel, and must have a cold test not above 5 deg. F. from Oct. 1 to April 1. It must be free from lumps and specks, and will not be accepted if it shows a precipitate after 5 cu. cent. of the oil have been mixed with 95 cu. cent. of gasoline 0.6422 specific gravity after having stood an hour. It must have a specific gravity about 0.8805, and its viscosity will be tested with a torsion viscosimeter.

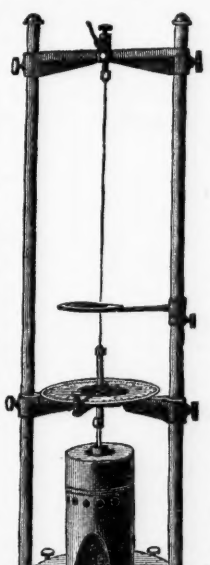
*Chicago, Burlington & Quincy.*—"15 deg." Black Oil: The flashing point must not be below 325 deg. F. It must flow at 20 deg. F., have a specific gravity between 0.8974 and 0.8805, and be free from dirt, grit, lumps and specks.

*Lehigh Valley.*—"15 deg." Well Oil: Flashing point not below 275 deg. F.; cold test not above 15 deg F.; specific gravity 0.8805 or lower. "Must be perfectly free from specks, lumps, dirt, grit and water."

On all of these roads the open or "Cleveland" cup is used for the flash test.

The torsion viscosimeter which is referred to above is the standard instrument of the Philadelphia & Reading. It is the design of Mr. O. S. Doolittle, and is said to have proved "reliable, accurate and satisfactory."

We give a cut showing this instrument, and a short description of it, taken from *Drugs, Oils and Paints:*



A steel wire is suspended from a firm support and fastened to a stem which passes through a graduated horizontal disc, thus allowing us to measure accurately the torsion of the wire. The disc is adjusted so that the index point reads exactly 0, thus showing that there is no torsion in the wire.

A cylinder 2 in. long by 1½ in. in diameter, having a slender stem by which to suspend it, is then immersed in the oil and fastened by a thumbscrew to the lower part of the stem to the disc. The oil is surrounded by a bath of water or paraffine wax, according to the temperature at which it is desired to take the viscosity. This temperature being obtained, while the disc is resting on its supports, the wire is twisted 360 deg. by means of the knob at the top. The disc being released, the cylinder rotates in the oil by virtue of the torsion of the wire.

The action now observed is identical with that of the pendulum.

If there was no resistance to be overcome, the disc would revolve back to 0, and the momentum thus acquired would carry it to 360 deg. in the opposite direction. What we find is, that the resistance of the oil to the rotation of the cylinder causes the revolution to fall short of 360 deg., and that the greater the viscosity of the oil the greater will be the resistance, and hence the retardation. We find this retardation to be a very delicate measure of the viscosity of an oil.

There are a number of ways in which this viscosity may be expressed, but the simplest we have found to be directly in the number of degrees of retardation between the first and second complete arcs covered by our pendulum. For example, suppose we twist the wire 360 deg. and release the disc so that rotation begins. In order to obtain an absolute reading to start from, which shall be independent of any slight error in adjustment, we ignore the fact that we have started from 360 deg., and take as our first reading the end of the first swing. Suppose our readings are as follows:

Right, 350; left, 338; right, 328, and keeping in mind the vibrations of the simple pendulum we will see at once that we have read two complete arcs whose difference is 22 deg., computed as follows:

1st Arc, Right, 350 + Left, 338 = 688
2d Arc, Left, 338 + Right, 328 = 666

22 deg. retardation.

In order to secure freedom from error we take two tests—one by rotating the wire to the right, and the second to the left. If the instrument is in exact adjustment these two results will be the same, but if it is slightly out, the mean of the two readings will be the correct reading.

It will also be noticed that if the exact retardation due to the oil alone is to be obtained, we must subtract the factor for the resistance due to the air and the wire itself. These are readily obtained by allowing the cylinder to rotate in the air, and determining the retardation exactly as we have done above. This factor remains constant for each instrument, and is simply deducted from all results obtained.

## Disastrous Collision on the Delaware, Lackawanna & Western.

Nine passengers were killed and over 40 injured in a rear collision of passenger trains on the Morris & Essex Division of the above named road, near the bridge over the Hackensack River, about three miles west of the Hoboken terminus, on the morning of Jan. 15. There was a dense fog at the time. The engineer of the foremost train, No. 20, a suburban express from Dover, N. J., for Hoboken, had slackened his speed in response to a torpedo signal and was running very slowly, probably less than eight miles an hour, when his train was run into at the rear by a suburban train from South Orange, No. 84, which the reports say was running about 20 miles an hour, but which, to judge by the damage done, must have been going faster. The rear car of the Dover train was a combination passenger and baggage. The floor of this was crushed for about ten feet, the length of the baggage room, and it was forced into the car ahead of it sufficiently to badly crush the end of that; and the second car was forced into the third, doing considerable damage there. The rear car was split open completely and some of the passengers were thrown across the adjoining main track and down a bank. The report of the New York *Sun* says: "Right into the rear car went the engine, lifting the roof up in the air. The edge of the roof cut off the smokestack of the engine close to the boiler and damaged the cab. Then the damaged rear car was forced into the car in front, telescoping it. The whole of the left side of the rear car was ground to bits. The right hand side of the car in front was cut off evenly along the window sills, and the left-hand side, with the roof adhering, fell off across the west-bound track. This second car had begun to telescope the third car when the train stopped."

No serious damage was done to the cars of the second train, but both trains ran forward 200 ft. or more after the first shock. The rear brakeman of the Dover train says (according to the reports) that on hearing the torpedoes he waited a few minutes, undecided whether to go back. When he did finally start back he heard the South Orange train when he had gone but a few feet, and he immediately ran to his own train and shouted to the passengers in his train to jump for their lives. A few only were able to heed this warning. Some reports state that the brakeman had gone some distance, and that he ought to have gone on instead of returning to his own train, but the weight of evidence seems to be that he had gone not over 50 ft. when he heard the other train close upon him. The last station which these trains passed before reaching the point of collision is Harrison, about 3½ miles back. Both trains were a little late.

There is no block system on this road, though trains follow each other closely. Between 7:30 a. m. and 9:30 a. m. there are at least 14 trains scheduled to leave Newark for New York, as follows: 7:32, 7:40, 7:48, 7:53, 8:05, 8:08, 8:13, 8,19, 8:29, 8:48, 8:52, 9:10, 9:13 and 9:28. The trains involved in the collision were the 8:08 and 8:13. They are due in Hoboken only three minutes apart.

## The Forging of Eye-Bars and the Flow of Metal in Closed Dies.*

BY H. V. LOSS, M. E., M. AM. SOC. M. E.

*(Concluded from page 6.)*

### *e.—Motors and Machines.*

As to the machines used in the art of eye-bar manufacture, they naturally vary according to the methods followed. As previously mentioned, the "First Method" represents a cheaper and less exactly fitted up plant as compared to the machinery at the "Second Method;" the principles of construction, however, being the same in both. In a general way, an eye-bar upsetting machine consists of: First, the horizontal upsetting cylinder; second, the vertical die-closer; third, the diebox, and, fourth, the gripping mechanism. The horizontal cylinder may be driven by steam or water. The die-closer may be a cylinder, the piston of which presses direct upon the diebox, in which case it is always driven by hydraulic power, or it may be a steam or water cylinder, operating through a set of wedges or toggles.

The diebox has already been treated as also to a certain extent the grip, which, however, will be referred to again in the following. Fig. 18 represents a machine, designed by the writer for the Keystone Bridge Co., and which is intended to upset as a maximum a 22-in. diameter head on a 9-in. bar, the upsetting cylinder being 28 in. in diameter with water of about 2,500 to 2,700 lbs. pressure per square inch. The die-closer is a vertical hydraulic cylinder, the piston of

which engages a set of very powerful toggles, thus multiplying the power manifold. The grip is of the top and bottom type, and is the only part of the machine that differs from the original design made by the writer for the said company. This detail will be explained later in connection with separate drawings. The diebox and die-closer are located in the main housing, to which the pushing cylinder and grip are both—one on each side—attached through horizontal tiebolts.

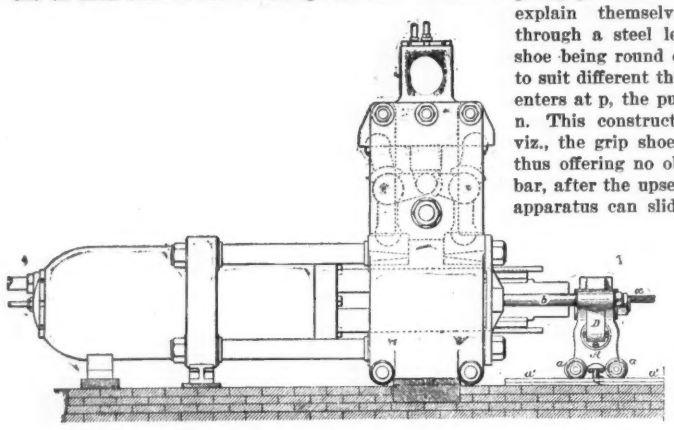


Fig. 18.

The dies used conform with the third system, and the machine throughout is constructed to work on the "Second Method."

A machine designed by the writer, and built for the Pencoyd Iron Works, is shown by figs. 19 and 20. The die-closer is shown as two side wedges, y, y, operated by separate hydraulic cylinders, y', y', thus greatly multiplying the downward pressure. The diebox is shown separately by figs. 11, 12 and 13, and the grip—not shown on the drawing—is the same as illustrated on fig. 18. This machine was designed only to make 13½ to 14½-in. eyes on 6-in. bars, and has therefore a rather small upsetting cylinder, 19 in.

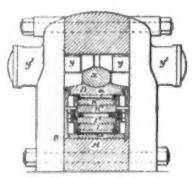


Fig. 19.

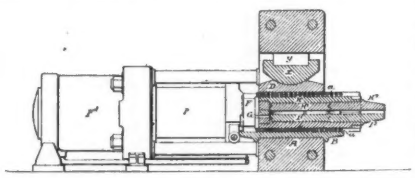


Fig. 20.

in diameter. The machine has proved itself fully capable, nevertheless, of making 18½-in. eyes on an 8-in. bar with only one reheating, working on the "Second Method." For very large capacities I prefer the direct die-closer; that is, a vertical ram acting directly on the diebox. If large pressures shall be transmitted through wedges, toggles or any other mechanical contrivances, the result is sure to be too much wear, besides also requiring enormous dimensions to withstand the intense pressure necessary to prevent the undue thickening of the eye. Such a direct method

Fig. 21.

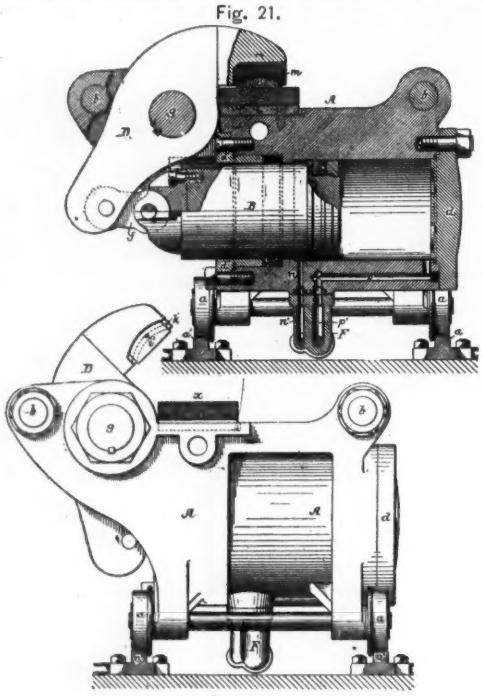


Fig. 22.

I have, therefore, used in designing the large machine previously mentioned, for the Pencoyd Iron Works, The vertical cylinder is therefore 46 in. in diameter, the horizontal cylinder having a diameter of 35 in., the water pressure being in both instances from 3,000 to 3,500 lbs. per square inch. This construction is also used by the Edge Moor Iron Co. in their large forging plant in present operation. This latter concern uses, however, a diebox on the principle of fig. 8, which embodies a side grip in form of two hydraulic cylinders, located one on each side of the bar.

The top and bottom grip used in connection with the third system is better illustrated by figs. 21, 22, 23 and 24. It is designed and patented by the writer and is giving good results. The drawings are very plain and explain themselves. A hydraulic cylinder acting through a steel lever compresses the bar x, the grip shoe being round on top to permit an easy adjustment to suit different thicknesses of bars. The driving water enters at p, the pullback water, being constantly on, at n. This construction permits one important feature, viz., the grip shoe will swing entirely out of the way, thus offering no obstruction whatever in removing the bar, after the upset is finished. See fig. 22. The entire apparatus can slide longitudinally with the bar, being provided with stuffing boxes for the water connections, so as to suit any length of die used.

The bar after being upset is now removed to a combined punch and shear, where the hole, allowing for finish for the boring mill, is made and the fins—the surplus material—sheared off on each side, all in one operation. The eye is next finished to thickness by hammer, press or rolls (see figs. 4 and 5), which being accomplished, the bar is sheared to correct length and the second eye made in a similar way. The bar is now stored on skids, until a sufficient number has been accumulated to form a charge for the annealing furnace, where it is heated by coal, wood, oil or gas to about 900 to 1,000 deg. Fahr., the heat being kept upon the charge for a few hours, after which the bars are permitted to cool. This cooling ought to be as slow as the continuous process of the upsetting plant will allow. Water annealing has not as yet been tried on eye-bars, but it would be exceedingly interesting to perform and watch any experiments made in this direction. The annealing being finished, the bar is straightened, bored and painted, after which it is ready for shipment. An improvement ought certainly to be made in the machinery, hitherto used for straightening purposes. A power-driven gag is not to be recommended, and a slow-going hydraulic press is but slightly better. If the bar could be straighted in a pair of rolls—like plates at the present time—and proper allowance could be made originaliy for the elongation which this method will produce, a better bar will undoubtedly be the result, and the effect of the annealing not so much undone. The greatest difficulty lies in the irregularities of the conditions of the eye-bars, one requiring much more straightening than another, resulting in different elongations all along. However, it is worth calling the attention of engineers to this subject, as I know from personal observation of peculiar effects in the testing machines, which effect could often be traced back to the straightening gag.

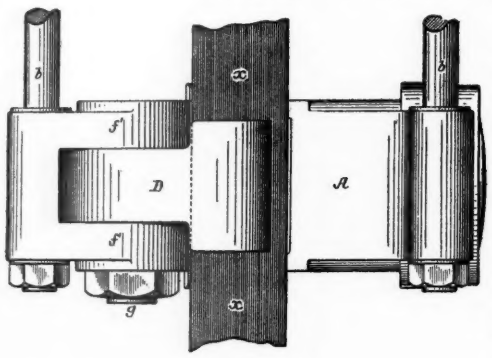


Fig. 23.

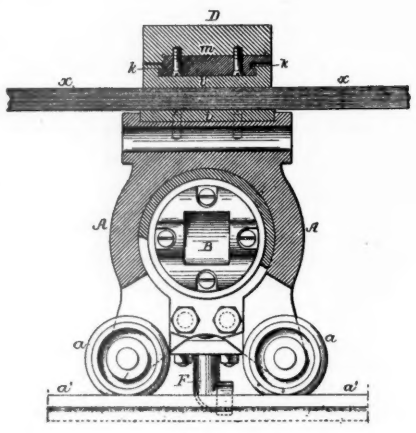


Fig. 24.

These are the general machines used in the manufacture of eye-bars, and may all be modified more or less to suit special practice. Cranes for handling the bar, pumps, accumulators, engines and many other contrivances of more or less importance will finally make up the remaining requisites of a plant, which is second to none as to the engineering skill and judgment necessary to build up a successful industry.

*f.—Pressures and Resistances.*

As to the power necessary to upset an eye-bar, this will vary greatly according to the methods and construction used. Repeated experiments have conclusively shown that a small eye requires relatively—and in some instances even absolutely—more power than a larger one. In a similar way a thinner bar demands a greater effort than a thicker one, other conditions being equal. All this is solely due to the fact that a thin or a small eye generally loses its heat so rapidly that the final pressure, which would necessarily have been the greatest one any way, meets a material very much cooled and very much harder to compress. This is another and a very good reason for increasing the bulk of material inside the diebox by upsetting two thicknesses at one operation. Experiments have repeatedly proved such a method to produce good results.

The vertical pressure in an upsetting machine will have to be very much greater than the horizontal effort. This is now well established, and many were the mistakes originally made by not realizing this fact. It ought to be anywhere from two to three times the latter, especially if—as with the "Second Method"—a comparative small amount of thickening is allowed during the operation. This is very natural when considering the large, horizontally exposed surface of the eye, each square inch of which is subjected to an intense pressure, which also pervades the entire mass of metal.

Speaking in a general way about any possible analysis of the forces, the resistances can be divided into two distinct parts, viz., *compressing the metal and overcoming all sliding or rolling frictions.* As to the latter, its relative amount is extraordinarily large, so much so, that its full extent is hardly ever realized. A simple calculation will illustrate this fact. A 9-in. eye, 1¼ in. thick, required 652,000 lbs., as taken from experiments made some years ago at the Edge Moor Iron Works. Considering the cross-section of eye to be $9 \times 1\frac{1}{4}$ in., equal to 11¼ sq. in., the direct pressure per square inch, allowing for no other resistance, becomes $\frac{652{,}000}{11.25} = 58{,}000$ lbs. This figure is very largely in excess of what is needed, the difference being made up by frictional losses and partly, to be sure, by forcing the metal to flow under an angle perpendicular to the direction to the upsetting force.

For larger bars the loss due to friction will be relatively smaller, but it remains, nevertheless, in all cases, too large and important a factor to be desirable. Hence the necessity of introducing the steel rollers, as shown on fig. 11.

The difficulty in specifying rules and formulas, for use in this class of work, lies in the unknown temperatures existing for the different sizes of bars. It is impossible to compute with any exactness the amount of heat conducted away through the dies and through the water, which latter is generally brought to play upon the diebox, when having a continuous run.

In order to throw some light upon the action of the metal during the last stages of the upsetting process in closed dies, the following analysis may act as a guide:

If the eye consisted of a perfectly melted mass, then it is obvious that a certain pressure per square inch imparted to this mass in a horizontal direction would cause the same pressure per square inch to exist in any other direction, thus causing a total upward pressure on the vertical ram, toggles or wedge, the amount of which would be larger than the total horizontal pressure from the pushing cylinder in the same proportion as the horizontal area of the head and neck is greater than the cross-section of the head. But as the eye is not a melted mass, especially during the last part of the process, the result is that the real vertical pressure is very much less, and the coefficient—a fraction—with which the amount, corresponding to a perfect fluid, must be multiplied in order to equal the real amount, I have called the coefficient of fluidity K, and which equals 1 for a melted mass, gradually decreasing as the cohesion of the metal increases, and which becomes very small, practically zero, for a cold bar. Let further: P denote the total upsetting pressure on horizontal ram.

$P_1$ = pressure on horizontal ram necessary to overcome the frictional resistances due to sliding, etc.

D = diameter of eye.

t = thickness of eye, as measured after thickening.

$\varphi$ = coefficient of friction for sliding of metal on metal.

Omitting the effect of the neck as being very insignificant and as causing very little upward reaction, the metal at this portion being very cold, we finally have:

$$P_1 = \varphi K \frac{P}{Dt} \quad \frac{D^2 \pi}{4} = \frac{\pi}{4} \varphi K P \frac{D}{} \qquad (1)$$

At the very last part of the operation the plunger presses practically against the entire back at the eye, causing a final flow and bringing the mass up to exact contour. Let the compressive action on the metal require an effort $P_2$, and introducing a constant $K_1$ d

pending upon the resistance to compression—and flow—we have:

$$P_2 = K_1 Dt \qquad (2)$$

The total upsetting pressure P, becomes the sum of $P_1$ and $P_2$, thus:

$$P = P_1 + P_2 = \frac{\pi}{4} \varphi K P \frac{D}{t} + K_1 Dt, \text{ or}$$

$$P \left(1 - \frac{\pi}{4} \varphi K \frac{D}{t}\right) = K_1 Dt, \text{ and, finally,}$$

$$P = K_1 \frac{Dt^2}{t - \frac{\pi}{4} \varphi K D} \qquad (3)$$

There are three unknown quantities, viz.: $\varphi$, K and $K_1$. It is probable that $\varphi$ does not vary very much with the different ranges of temperature at which the bars are finished, but $K_1$ and K will certainly greatly depend upon the finishing heat. A review of eq. (3) will indicate that as the member $\frac{\pi}{4} \varphi K D$ approaches t in value a decrease in thickness will vastly increase the necessary upsetting pressure. This is fully confirmed by experiments, as previously mentioned with sliding dies.

In order to adapt eq. (3) to a sliding system of dies experiments will have to be made, sufficient in number to fully establish the values of these different constants. As $\varphi K$ can be considered as one factor, two constants remain to be determined. As friction is caused simultaneously on several surfaces, $\varphi$ will represent the sum of their respective coefficients.

The writer has not as yet had the opportunity of determining the constants for the third system, but does possess some data, as taken from the Edge Moor plant, relating to the second system, although they all refer to smaller bars. In order to finally establish their values, additional experiments on larger sizes ought to be made.

However, it took 588,000 lbs. to finish a 6½-in. eye ¾ in. thick. Likewise 652,000 lbs. to finish a 9-in. eye 1¼ in. thick, and, finally, about 600,000 lbs. to complete a 7-in. eye of 1⅛ in. thickness. The three cases give somewhat different results. As average values, we derive after the insertion of the above figures in eq. (3):

$$\varphi K = \frac{1}{10} \text{ and } K_1 = 30{,}000,$$

which value of K represents the pressure per square inch to form edges and cause flow. In view of what has been said in the earlier part of this paper on the value of such a constant in closed dies, the result does not appear much out of the way.

After inserting the constants we finally derive the necessary upsetting pressure for the second system:

$$P = 30{,}000 \frac{Dt^2}{t - 0.078\ D} \qquad (4)$$

The question may be asked: What relation ought to exist between thickness and diameter of eye to insure the least necessary upsetting pressure? This is answered by differentiating eq. (4), with regard to P and t and making $\frac{d P}{d t} = 0$. Proceeding, $\frac{d P}{d t} = 30{,}000 \frac{2 t D (t - 0.078 D) - Dt^2}{(t - 0.078 D)^2} = 0.$

This is only satisfied by making

$$2tD\ (t - 0.078\ D) - Dt^2 = 0, \text{ or}$$

$$2t - 0.156\ D - t = 0$$

$$t = 0.156\ D \qquad (5)$$

Inserting this value of t in eq. (4), the necessary upsetting pressure for eyes of this relation becomes:

$$P = 30{,}000 \frac{D\ 0.156^2\ D^2}{0.156\ D - \frac{1}{2}\ 0.156\ D} = 9{,}400\ D^2 \qquad (6)$$

If t is above the limit, as prescribed by eq. (5), the compression of the metal requires an increased effort; if below it, the frictional resistances increase and will require additional driving power. Eq. (5), however, will generally give too large values, as compared to the practice of bridge construction, but it shows, nevertheless, the advantage of the "doubling up" process, previously mentioned. For large eye-bars eq. (4) with constants $\varphi K = \frac{1}{10}$ and $K_1 = 30{,}000$ will invariably give too large results, because of the larger masses here treated being finished at a much higher heat. The writer does not as yet possess any experimental data that would permit him at the present time to give the constants for bars, say, from 6 in. and upward. The constants for the third system would also be very interesting, as showing the mathematical difference between the two constructions.

It is the hope of the writer, however, to secure this additional data at an early period. Still it must be remembered that the furnace has greatly to do with the power necessary. A poor heat will as surely give bad results—as sliding through to the grip, etc—as a good soft heat will facilitate the work. The experimental data, the constants, have been based upon a good heat and a good warm diebox, which latter will only be brought up to proper working temperature after several upsets have been made.

In finishing this article, it is the sincere hope of the writer that it may prove of interest and use not only to the many who at the present time are interested directly or indirectly in the forging and use of eye-bars, but that the principles laid down, especially in reference to the die construction, may throw general light upon the forging and flow of metals, when confined in closed dies.

## The Atchison as an Object Lesson.

As it turns out, practically nothing that has been said by the officials in regard to the company's position is deserving of belief; it has, in fact, been wholly deceptive in its character, although perhaps this was not intentional. For instance, only two or three weeks ago the President, Mr. Reinhart, on his return from England to New York, affirmed positively that all difficulties had been overcome, and that the adverse rumors which had been current had no better foundation than the desires and imaginations of the "bears." The interest due on Jan. 1 was "going to be paid, for certain." And as a commentary on all this, we had the news a fortnight later that the company had passed into the hands of receivers.

Now, the annual report of the Atchison, Topeka & Santa Fe was only recently issued, and it will be well, before founding any arguments upon the company's experience, to see if the figures which were published gave the ordinary investor any true idea of the company's position. First, it is to be noted that a large surplus—no less than $1,754,000—was earned in the twelve months ended June 30, over and above all the fixed charges, which amount was carried forward, owing largely to the adverse effect which was exercised upon the mining and other industries of the West by the fall in the value of silver; but still a substantial balance seemed to be in hand. So much for the revenue account proper, but, of course, it is to the so called floating debt, which has led to the downfall of so many American railway companies, that we have mainly to direct our attention. And on June 30 this was set out as follows: Liabilities, $23,611,000; assets, $27,745,000.

Here we have shown a balance of over three millions of dollars; and how is any one, not an expert or an official, to be blamed if he regards that as a proof of the stability of the company's position? It is, of course, obvious at once to those who look at the figures with a critical eye, that there is a balance on the wrong side of something over seven millions of dollars, since it would be sheer madness to go on piling up floating debt at high rates of interest under the head of "Bills payable" if the eleven millions odd of securities in the treasury were really "marketable." As a matter of fact, the latter could not be realized any more than the reserve fund of a bank which falls into difficulties and has the funds invested, not in good securities, but in its own business. The accounts receivable and payable about offset each other; but whereas payment of the former cannot be safely pressed beyond a certain amount, the latter can easily prove a source of trouble. Finally, we may add, there was cash to the amount of $5,165,000 in hand, against imperative claims—bonded interest, etc.—of $6,183,000; for the so-called "demand loans," or advances to subsidiary companies, may be ignored. This is a specimen of the ordinary American railway balance sheet, and, embedded as it is in a mass of figures, we do not think that investors are to be blamed if they fail to discern what is the true position.

Why the directors do not state the case plainly in a few plainly written lines, we cannot say, unless it be that it better suits their purpose to keep the shareholders entirely in the dark. One is loath to make such an accusation against the officials of the Atchison, for what is true of them applies more or less thoroughly to all American railway officials; and yet that is what we must believe, or else that the whole system of finance which they have adopted is entirely rotten. Primarily, we believe, the difficulties have arisen out of the plan of borrowing money for capital purposes, not, as it were, openly and directly, but indirectly and secretly. The balance of revenue, which really belongs to the shareholders, is used up in this way, we suppose, and then further obligations are entered into on the strength of future revenue, paper in some form being issued temporarily as security. Nothing is said to the bond or share holders, who are compelled to remain in a state of complete ignorance until the stress of circumstances discloses a floating debt which cannot be dealt with except by reorganization. And so the process goes on *ad infinitum*, to the great loss of the shareholders and to the profit of the officials, with their fat salaries, and whatever "pickings" may accrue besides—often, it is said, of much greater importance—and to the still greater gain of the gamblers in Wall street, with whom, it is to be feared, they too often work closely hand in hand. As for those who own the property—well, they enjoy a back seat. They are either, it would appear, told nothing, or else they have foisted off upon them what may be mildly termed misrepresentations. But every few years they are called upon to "foot the bill" under some new scheme of reorganization, which is usually inequitable, since nine times out of ten the shares, which are largely owned by "insiders" on account of their voting power, are let off lightly, or escape scot free, while the bondholders, a helpless flock scattered throughout Europe, are squeezed as much as possible. It is no wonder that investors on this side of the Atlantic have become disgusted with such chicanery, for indeed they would need to enjoy an absolute superfluity of faith or credulity to believe any longer in the honesty of most American railway managements. But unless the current of investment capital which flows from this country and the Continent is to be dried up permanently, it would be well to apply at once some effectual remedy to the abuses which now flourish in the United States.—*The London Economist.*

## The Leavenworth Bridge.

The bridge over the Missouri River at Leavenworth, Kan., was opened Jan. 1. A brief description of this bridge follows.

It consists of two spans of 330 ft. each and one draw span of 440 ft. long, all between centers of end pins; the bridge being about 1,108 ft. long between centers of bearings on the abutments. The draw is next to the Kansas shore. The bridge is adapted to both highway and railroad traffic, carrying the two on the same floor.

The two abutments, both of which are on the protected shore lines, are founded on piles. The three piers are founded on the rock, the foundations being put in by the pneumatic process. The masonry is of Cottonwood limestone, the cut-waters of piers II. and III. being of granite. The entire substructure was built by contract by Mr. A. J. Tullock, of Leavenworth.

The superstructure is of steel, the principal truss members being medium steel, punched and reamed, and the floor system and laterals of soft steel punched, but not reamed. The superstructure was built and erected by the Union Bridge Co., of New York, which took the contract for the entire bridge, subletting portions of the work.

The east approach is across a broad sandbar. It is built in the form of a solid sand embankment covered with coal shale, while a dike of brush and stone has been built about one thousand feet above, to confine the channel within the limits of the bridge. This dike, constructed before the high-water season (of 1893, has already had the effect of raising the sandbar very materially.

The Leavenworth Bridge is the property of the Leavenworth Terminal Railway & Bridge Company, of which Mr. E. W. Snyder, of Leavenworth, is President and Mr. Vinton Stillings is Secretary. The same company has constructed a system of terminals in the city of Leavenworth, which, together with the railroad track on the bridge, is leased by the Burlington Route and the Chicago, Rock Island & Pacific Railway, the two systems maintaining a joint station.

The bridge was constructed under the direction of Mr. George S. Morison as Chief Engineer, with the help of his associate, Mr. Alfred Noble; Mr. M. A. Waldo being Resident Engineer.

One cannot help reflecting upon how different things would be if this bridge had been built about 25 years ago. At that time Leavenworth was the metropolis of the Missouri Valley, and all business interests which have since centered at Kansas City would have remained at Leavenworth, which would have had the support instead of the opposition of the State of Kansas, from which its trade comes, and would probably to-day be a city of nearly 200,000 people, or about eight times its present size.

## Maine Railroad Commissioners' Report.

The Railroad Commissioners of Maine, D. N. Mortland, A. W. Wildes and Benj. F. Chadbourne, have issued advance sheets of their thirty-fifth annual report, which is for the year ending Nov. 30 last, though the statistics are based on returns made by the railroads for the year ending June 30. These returns show the length of railroad in the state as 1,399 miles, the increase since the previous year being 15 miles, the extension of the Portland & Rumford Falls. The Green Mountain Railway was abandoned during the year. The Bangor & Aroostook, 95 miles long, lately finished, is not included in the report, but is referred to in a later chapter and commended as a well-built road. Only one passenger was killed and ten injured during the year. Six employees were killed and 31 injured, mostly in coupling and uncoupling freight cars. The length of street railroad in Maine is 76 miles, an increase of 18 miles over the previous year. Two street roads transport freight as well as passengers.

A circular was sent a year ago to several railroads inquiring about the strength of certain bridges. Nearly all the railroads in question have made reports "which, if reliable, show that the bridges are strong enough to safely carry the loads to which they are subjected." The Maine Central has made no answer, but the Commissioners have been assured that the bridges criticised on that road are to be removed this year.

The Commissioners refer to the general financial depression, but they say it has not affected business much in Maine, and they doubt the necessity of the sweeping reductions in train service and wages made by some of the railroads in that state; and the managers are reminded that their business is not strictly private. The reported intention of some of the larger roads to take off passenger trains that do not yield a profit is criticised. If this policy is carried out, some thin lines will be suspended entirely during the winter months, "a result which, it is needless to remark, would not be tolerated." The National car coupler law is quoted and commented upon, and the Commissioners trust that the railroads will early determine the type of coupler they will use and comply with the law promptly. The heating of passenger cars by steam from the locomotives is now in general use in Maine.

Several pages are taken up with a historical sketch of the railroads in Maine, showing numerous comparisons between the condition of things in 1860 and in 1893. It appears that the main feature of this sketch consists in a number of illustrations of old and new engines, bridges, etc., and for these we must wait until the finished report comes out.

## The Baldwin Locomotive "Columbia."

This locomotive, which, for the past two or three weeks, has been in use upon the Chicago, Milwaukee & St. Paul, is said to be doing excellent work in passenger service between Milwaukee and Chicago. The engine left Milwaukee with train No. 4, consisting of ten vestibule cars, on Jan. 15 at 7:20, five minutes late, and lost four minutes between there and Western Union Junction, 23 miles, a run scheduled at 40 minutes. From Western Union Junction to Forest Glen, a distance of of 51.6 miles, the run was made in 58 minutes, taking water and making two crossing stops. From Forest Glen to the Union Depot, Chicago, 10.2 miles, the trip was made on schedule time, arriving at 9:30 a. m.

RAILROAD GAZETTE

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## EDITORIAL ANNOUNCEMENTS

**Contributions.**—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies in their management, particulars as to the business of the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

**Advertisements.**—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting, and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

We reprint on another page an extract from a long article in the London *Economist* on American railroads, with the Atchison as a text. The *Economist* is one of the half-dozen most important financial journals in the world, and in this article it repeats and indorses what we read every day in other foreign papers. Doubtless its generalizations about the management of American railroads are unjust. It reasons from a few unfortunate examples, and ignores the mass of honorably conducted enterprises. But from one point of view it makes no difference whether the *Economist* is right or wrong. So long as foreign investors think it is right, our credit is injured; and there is no doubt that a few American railroad men have ately discredited American railroad securities terribly at home and abroad. The honorable and the prudent suffer in reputation with the dishonorable and the adventurous; and it is wholesome for us to know and think about what the Englishmen are saying about us.

One of the most significant indications of the condition of business in the Northwest is the consumption of lumber, and there was a time when the Chicago receipts and shipments were a pretty fair index of the course of such consumption. For several years, however, the increasing direct rail shipments from the mills to the Western consumers, especially from Wisconsin and Minnesota mills, have lessened the significance of the Chicago lumber trade, and the World's Fair has further affected it; the enormous construction within the city in preparation for the fair having vastly increased the city consumption for some two years before the opening of the fair, and reduced it since. So far we have only statistics of the Chicago lumber receipts, which show a decrease from 2,250,298,000 ft. in 1892 to 1,621,627,000 last year, the amount of the decrease being 628,671,000 ft., or 28 per cent., a truly enormous reduction, bringing down the receipts about to those of 1886. A very important part of Chicago receipts now come by rail—last year no less than 47 per cent. of them. Not many years ago the rail receipts were insignificant. The change is partly due to the exhaustion of the white pine accessible to mills situated on the lakes, but also to a considerable extent to the increasing consumption of hard wood lumber and the hard Southern pine. Thus while the distribution of lumber from Chicago has decreased, lessening shipments over the railroads to the West, the total rail lumber traffic has been increased by the growth in rail receipts.

A western correspondent writes as follows:

Under the proposed trunk-line agreement for the division of eastbound freight it is understood that each line will promise to restrict its tonnage to the amount required to make the allotted percentage; but how is it proposed to "restrict" the business of any line? The most generally approved plan has heretofore been to make diversions necessary to equalize, but this has proved a very weak plan, as will be remembered by every one familiar with the attempt made about a year ago, which failed before it began, almost. The failure of the pool between the Missouri River and Chicago, when the Atchison refused to divert freight as directed by the arbitrators, will also be recalled by those interested. Moreover, one of the important connections of the trunk lines has been opposed to any such plan, and unless it has recently radically changed its position the only way that the equalization can be effected will be for the line temporarily in excess of its allotted percentage to go out of the business on some particular commodity or commodities for such period as may be necessary to offset its excess. But there is an objection to this plan in the fact that all the lines have time contracts on the more important commodities which would be seriously interfered with. It is said in Chicago that if the proposed agreement is put in operation, and it is attempted to equalize the tonnage, several of the large shippers there will combine and bring a test case before the Interstate Commerce Commission.

They would not be true Chicago hustlers if they did not bring such a complaint. Chicago is not expected to be satisfied with any freight rates, however low. But it is not likely that the roads will try diversion. The experiments in that line, as intimated by our correspondent, have been too unsatisfactory. The last named method, "going out of business" temporarily, ought to be feasible, however. A road which does so much of its business on time contracts that it cannot shrink the volume of its freight without disturbing the shippers, must be in the enjoyment of an exceedingly "soft snap," and its soliciting agents must have hard work to while away their time. We should suppose that any ordinary road could decrease its freight business considerably by having a few agents go a-fishing for a week or two now and then. But an agent who gets enough contracts in a day to keep the freight crews busy for a month is a hard customer. The only way to deal with him would be to send him to Europe, and shut up his office; and then the Chicago shippers would complain, *sure*. We advise the shippers to keep cool, however; for we have some doubts about the willingness of the managers to suspend their agents for good behavior.

The pitcher that goes oft to the well at last gets broken. The Delaware, Lackawanna & Western Railroad, boasting that it carried passengers for 40 years (on the Morris & Essex division) without ever killing one, has now killed nine and injured twoscore in one accident. As will be seen by our account in another column, the bare facts explain why this collision occurred, without any comment whatever. The trains were scheduled within four minutes of each other, there was a dense fog, and no pretense of maintaining any space interval. The great wonder is that so many trains, so close together, have been run for so many years without disaster. It certainly must be true, as is often asserted, that the men who handle and guard the trains on this road are exceptionally well qualified and that the discipline is good. But the best men in the world cannot run trains safely under the conditions just mentioned; and in fact, if common report is true, the only way that safety has been secured has been by losing time constantly. Even in clear weather, according to the passengers, trains are always late. But with thousands of passengers clamoring for better service there must always have been a strong temptation to run as close to the margin of safety as possible, and that is a policy which surely brings disaster sooner or later. For this the company is solely to blame. It is probably true that *if* the rear brakeman of No. 20 had got off as soon as he could, and had gone back as fast as he could, he would have signalled No. 84 in time to prevent the collision, but that is just the if that experience teaches us to guard against as dangerous Possibly the operating officers disagreed as to when or how the system ought to be changed or improved; but the public will ask in that case why the President or directors did not compel them to come to a decision, for the prevention of rear collisions has come to be too important to be classed as a mere detail of operation; it is fast coming to be a question in which public opinion is directly interested, and directors, even those who "do not direct," will find it impossible to ignore it. The directors or anybody else should not be misled by any one's statement that "men are better than machines," or that block signals could not have been seen in the fog. The experience of years, on the best railroads of the world, proves that safe running requires men *and* "machines," and we all know that there are such things as automatic torpedo placers of demonstrated value, and that there are promising devices for stopping a train in spite of the engineer. The point where the good discipline of the Lackawanna failed is indicated by the unofficial statements of officers of the road to reporters, that they lay the chief blame upon Mr. Hoffman, engineman of train 84. The point of collision was at or near the approach to a drawbridge where it was necessary to slacken, in foggy weather, to look out for the bridge signal. It seems to have been assumed that all trains would slacken there; and, in fact, preceding trains had slackened and had put down torpedoes; but, as every superintendent or trainman knows, after the slackening process has been thus repeated by two or three trains, close together, the point where danger of collision comes in is moved back; and this collision occurred about 1,200 ft. short of the bridge. It is no exaggeration to say that depending upon individual enginemen to know where to reduce speed, and how much, in such a case, invites disaster. The one thing on which the survivors of the wreck may specially congratulate themselves is the fact the cars were heated by steam from the locomotive.

The general passenger agents of the Trunk-line and Central-traffic roads have agreed upon a report to the general managers looking to the establishment of a passenger agreement based on the same general principles as those of the freight agreement, reported a week ago. Since the falling off in passenger traffic after the World's Fair the payment of commissions has become very lawless, and it is expected that the desire to stop this waste will impel all the roads to ratify the new agreement without delay. The agreement provides that inequalities shall be adjusted by changing the differentials, and there is a promise, the same as in the freight agreement, to consolidate agencies wherever possible; but it does not appear that anything definite in this line has yet been talked about. It is left to the general managers to decide whether to adjust rates according to an estimate of the proper distribution of *all* passengers or only of those from competitive points. The roads seem to have voted unanimously to stop the payment of commissions in their own territory, but in outside territory some think that commissions had better be paid, and no agreement has been reached on this point. Whether the payment of commissions which led to the present demoralization will be stopped before the general managers meet to ratify this agreement (Jan. 24) does not appear. One of the inherent difficulties of the situation is stated by a general passenger agent, whose views are given in in a St. Louis paper. He says:

The trunk-line rate situation is not likely to be soon adjusted. The giving of differentials has entirely failed to settle the question of how to give weak lines a fair share of the business from common points. When tickets are offered for sale between the same points at different prices over different lines, nobody can be induced to purchase the tickets over the low-priced line, but if the low-priced lines make an open rate the same as that on the best lines and then make a cut they get all the business. Rate cutting then seems to be the only way in which weak lines can keep business.

In other words, a reduction, to be appreciated by the public, must be a secret reduction. If the Baltimore & Ohio, for instance, advertises in Chicago to carry passengers to New York at two or three dollars less than the Pennsylvania asks, passengers regard it as an inferior line, and do not want to ride over it at any price; but if it pretends to charge full rates and thereby claims to be as good and as short as the Pennsylvania, then they will accept an informal reduction and buy their tickets that way. Quite likely there is a substantial basis for this view, for one of the cardinal business principles of the people who buy from scalpers is to get their goods a little cheaper than other people get them—or to make believe that they do. The need of a pool appears more forcibly in the attempts to regulate passenger traffic than it does in freight matters. Freight involves a larger volume of earnings, of course, but the technical details seem to be harder to arrange in the passenger department. But the prospect that any action will be taken by Congress toward the repeal of the law against pooling seems just now to be poorer than ever.

It has been said, not only in the daily newspapers, but by railroad men, that the cars involved in the accident of Monday were of weak design, and that with proper construction the results of the telescoping would not have been nearly as serious as they were. While we are not hunting for faults in railroad management, and regret as deeply as anybody can the occasions for criticism which so frequently arise, yet we looked upon this as a possible illustration of the defects in passenger car construction concerning which we have recently had so much to say. Some time ago we tried to get drawings of the passenger cars of the Delaware, Lackawanna & Western, but without success. Therefore, in order to ascertain what the posssible weaknesses of the cars involved in the recent collision were, it became necessary to make a personal inspection of the cars running into the Hoboken station on through and surburban trains. A careful inspection of the underframing of the coaches there reveals no weaknesses or defects that warrant the severe criticism of some of the daily papers. Of the cars that are run in regular passenger service it was found that the underframing consists of six sills, the side sills 5 in. ×

8 in., the intermediate and center sills 4 in. × 8 in., re-enforced on the sides by strips, to which the boxing underneath was nailed. Nearly all of the coaches are boxed, which adds stiffness to the sills. The end sills are of the usual size, 8 in. × 8 in. The baggage and express cars measured had eight sills instead of six, with 11 in. × 8 in. end sills. The platform end sills of coaches run from 8 in. × 8 in. in the middle and 7½ in. × 8 in. at or near the ends. While it is true that the company is using the Miller hook and Miller platform, that fact is no more than may be said of a great many roads which prefer to wear out this equipment before adopting a new one. Moreover, it is not the universal judgment of car-builders that the present form of M. C. B. coupler is the best or that it is greatly superior to the Miller hook. In fact, at the last Master Car-Builders' convention there was considerable doubt expressed as to the superiority of the M. C. B. knuckle coupler. A superficial inspection of the D., L. & W. cars will show that they are generally equipped with the modern devices, and that the company has put upon the platform of recent construction the Pullman brake-shaft, doubtless with a view to making provision for vestibules. The cars of the Western Division have been equipped with the Gould buffer and continuous platform, and some of these are in service on the New York end of the line. The cars are lighted with Pintsch gas and heated with steam from the locomotive and are in general, equal to the average rolling stock in use by the railroad companies of the East. This accident suggests the advisability of equipping suburban cars with anti-telescoping devices, and we see no reason why the framework of a vestibule, with the face-plates and overhead equalizing attachments, should not be used on suburban cars. The only objection made to vestibules on suburban trains is that they obstruct the passageway, so that the cars cannot be so quickly filled and emptied, but this objection would not exist if the framework only were built as proposed. Apparently, the cost is the only thing against the adoption of vestibule frames on all cars.

## World's Fair Travel and Other Traffic.

The Chicago, Burlington & Quincy is, we believe, the only Chicago railroad which makes monthly reports of passenger and freight earnings separately, which are requisite to an understanding of the effect of World's Fair travel on earnings, and also to a judgment of the general condition of traffic on the Chicago railroads of late months; for with the Fair travel increasing earnings and the stagnation in business decreasing them, we cannot estimate the true effect of the stagnation until we know how great was the effect of increased travel. Though the Burlington company issues statements of its earnings from different sources, the newspapers generally publish only the totals, so that the information concerning the course of freight earnings, specially valuable at this time, is not widely spread.

Down to the end of April, Chicago, Burlington & Quincy earnings were, in 1893, not much different from what they had been in 1892. There had been an increase of $105,522 (3.9 per cent.) in passenger earnings and of $176,415 (2.1 per cent.) in freight earnings—wholly insignificant changes. With the opening of the World's Fair, passenger earnings increased materially from the first. Naturally, as this road was only one of many carriers to Chicago, the proportion of increase was nothing like that on the Pennsylvania in 1876, which carried by far the larger part of the passengers to the Philadelphia fair. As we showed May 26 last (page 396), the passenger earnings of the Pennsylvania's New Jersey lines and its "Pennsylvania Railroad Division" during the first four months of the fair increased more than 41 per cent. Those of the Chicago, Burlington & Quincy in the corresponding months of the Chicago fair increased 23¼ per cent. The amount of the increase was $1,177,803 on the Pennsylvania and $702,314 on the Burlington. Considering the relative proportions of the total fair travel commanded by each road, the increase on the Burlington is by far the more remarkable. As we showed May 26, much the larger part of the travel to the Philadelphia exhibition was after August. This was true also at Chicago, we believe, taking it altogether; but the increase in the Burlington's passenger earnings was less in September than in any previous month of the fair, and only in October was the increase very much greater than in the earlier months. September, however, is always a month of great travel on this company's lines, and the smallness of the increase in 1893 did not prevent the total passenger earnings in that month from being the greatest of any month of the year save October alone.

In comments on November and December earnings it has been common to explain great decreases by the sudden and total cessation of World's Fair travel. It seems to be forgotten that those who visited the fair in its last days, when it was most crowded, had to go home in November or later, and that very many people united their visit to the World's Fair with another journey, often accomplished afterward. We showed May 26 that on the Pennylvania in 1876 the increase of passenger earnings in November (10 days of fair), and even in December, was greater than in any of the first three months of the fair, and for the two months of November and December was very nearly as great as for the first *four* months of the fair. We have now the Burlington's report for November, showing in that month an increase of passenger earnings but little less than in August or September.

As there is a permanent value in the results of travel under the special stimulation of such exhibitions as those at Chicago and Philadelphia, we give below the passenger earnings of the Chicgo, Burlington & Quincy Railroad for each month since the opening of the fair, as also their aggregate for the four previous months of the year:

CHICAGO, BURLINGTON & QUINCY PASSENGER EARNINGS.

| | 1893. | 1892. | Increase. | P. c |
|---|---|---|---|---|
| Four mos. to April 30.. | $2,625,159 | $2,519,637 | $105,522 | 3.9 |
| May..... ..... ..... | $781,500 | $628,926 | $152,574 | 24.3 |
| June..... .. | 940,399 | 705,743 | 234,656 | 33.2 |
| July..... ..... ..... | 990,857 | 801,235 | 189,622 | 23.7 |
| August..... | 1,009,216 | 883,754 | 125,462 | 14.2 |
| September.... ..... | 1,150,646 | 1,028,103 | 122,543 | 11.9 |
| October..... ... | 1,268,797 | 887,790 | 381,007 | 42.9 |
| November.. ..... | 829,954 | 711,496 | 118,458 | 16.7 |
| Seven mos. to Nov. 30. | $6,971,369 | $5,647,048 | $1,324,321 | 23.4 |

We may compare with the above increases those of the Pennsylvania Railroad in 1876:

| May. | June. | July. | August. | Sept. | October. | Nov. |
|---|---|---|---|---|---|---|
| $128,062 | $302,260 | $351,483 | $395,998 | $1,004,465 | $1,010,859 | $707,004 |

The total increase for these seven months was $3,900,130 (77 per cent.) on the Pennsylvania, against $1,324,321 (23½ per cent.) on the Burlington. As the Pennsylvania carried most of the passengers from the East as well as from the West to the Philadelphia exhibition, the Burlington's gain is really the more notable. A much more significant comparison is with the increase in passenger earnings of the Pennsylvania Railroad Division of the Pennsylvania—the main line between Philadelphia and Pittsburgh, with its branches, 963 miles in all, carrying the whole great through travel from the West. This was $1 594,395 in 1876 for the whole year, or but $250,000 more than the Burlington's gain in seven months. The mileage of the Burlington is many times as great, it is true; but we are taking into account only the World's Fair travel, indicated by the *increase* in passenger earnings, which was divided among some 20 competitors at Chicago, several of which may have had as much, or nearly as much, as the Burlington. The indications are, then, the railroads as a whole earned very much more from fair travel in 1893 than they did in 1876.

But we should study this statement of earnings not only to see what effect the Fair had on them, but also to ascertain the general condition of traffic aside from this stimulus, which is indicated by the *freight* earnings, and this will be a melancholy task. Down to the opening of the Fair, as we have said, the Burlington freight earnings were nearly the same in 1893 as in 1892, there having been an increase in the four months of $176,415, or about 2 per cent. In May, the first month of the Fair, these earnings increased by the substantial amount of $284,846 (15.2 per cent.), which coupled with the gain in passenger earnings, made a very handsome showing. But since May the record has been disheartening. The figures for the aggregate freight earnings for the first four months of the year and for every month since have been:

CHICAGO, BURLINGTON & QUINCY FREIGHT EARNINGS.

| | 1893. | 1892. | | Inc. or Dec. | P.c. |
|---|---|---|---|---|---|
| Four mos. to Apr. 30.... | $8,502,143 | $8,325,728 | I. | $176,415 | 2 1 |
| May..... ..... | 2,161,641 | 1,876,795 | I. | 284,846 | 15.2 |
| Five mos. to May 31.. | $10,663,784 | $10,202,523 | I. | $461,261 | 4.5 |
| June ..... | $2,027,672 | $2,267,607 | D. | $239,935 | 10.6 |
| July..... | 1,624,422 | 2,053,502 | D. | 429,080 | 20.9 |
| August..... | 1,763,971 | 2,493,069 | D. | 729,098 | 29 2 |
| September ..... ..... | 2,060,302 | 2,787,669 | D. | 727,367 | 26.1 |
| October ..... | 2,224,865 | 2,812,988 | D. | 588,123 | 20.9 |
| November..... | 1,915,789 | 2,429,556 | D. | 513,767 | 21.1 |
| Six months to Nov. 30. | $11,617,021 | $14,844,391 | D. | $3,227,370 | 21.7 |

The badness of freight traffic has been partly concealed by the important gains in passenger earnings, though these for the six months of bad freight business were $2,000,000 less than the losses in freight earnings; while for the entire 11 months of the year there is a decrease of $2,766,109 in freight earnings, against an increase of $1,429,843 in passenger earnings, the other earnings (very important on this road) having changed slightly (decrease $71,607).

The favorable feature, if there can be said to be any in the monthly freight earnings is that the decrease was "only" 21 per cent. in October and November, against 29 and 26 per cent. in August and September.

As the time has now come when the Fair travel has really come to an end, and a decrease rather than an increase in passenger earnings is to be expected, reports of total earnings indicate more closely than they did the actual condition of business. But as sufficient credit was not given in past months to the effect of the World's Fair, some now infer from the larger decreases in railroad earnings that general business has recently grown worse. Consideration of all the facts, however, does not warrant such an inference. Business a few months ago was worse than indicated by railroad earnings, and now they reflect its true condition, as freight earnings did all the time.

## Railroad Earnings in 1893.

In an accompanying table are given for twelve months ending October, 1893, the monthly gross and net earnings, and for fourteen months the gross earnings of all the roads in the United States which report both gross and net returns each month. The returns may be taken as typical of the important roads of the country. The most noteworthy feature is the steady decline shown in gross earnings from June 1, the approximate date of the beginning of the "panic." Up to that date gross earnings showed increases for every month except February, in which month the decrease was caused by abnormal weather conditions. In July, August, September and October the falling off in gross earnings of an average of 130 roads was $21,379,946, or over $5,300,000 a month. When it is considered that this decrease in earnings was partially offset by passenger traffic to the World's Fair, which was particularly heavy during September and October, it will be evident that the earnings on freight traffic decreased much more than that amount. The payments for freight represent only a small portion of the value of the goods transported. With this fact in mind, the reader can form some notion of the enormous falling off in business in the country.

Despite the heavy shrinkage in gross, net earnings in the last months of the year will show a comparatively small decrease owing to the severe economies, which do not seem to have had much effect in returns before October. In July we find 7.36 per cent. of decrease in the net against 4.85 per cent. for the same month in gross. In August the net decrease was 19 per cent, the gross decrease 13.29 per cent. In September the net decrease was 8.7 per cent. and the gross 9.77 per cent. In October the net showed an increase of 1.3 per cent. against a gross decrease of 2.38 per cent. This reduction of operating expenses was brought about by cuts in wages, reduction of forces in all departments and almost total stoppage of repairs, betterments and extensions.

In September, when the first effect of the shock was felt, the gross decrease was 9.77 per cent. In October, owing to the World's Fair traffic, which was very heavy, the gross decrease was but 2.38 per cent. In November, owing among other things to a falling off in passenger traffic, the gross decrease was 6.65 per cent., while in December the gross decrease amounted to 13 per cent. The December decrease shows a very discouraging condition. The returns of operating expenses for November and December are not in, and consequently comparisons cannot be made. It is believed that they have been so far kept down that the decrease in net earnings will be comparatively small. In this steady decrease in gross there is little promise of immediate improvement, and should it continue net earnings must necessarily suffer, for it is likely that the point has been reached where further reductions in expenses are almost impossible. Even many roads are suffering for repairs and betterments.

The conditions affecting railroad earnings in each of the months considered may be briefly summarized:

In November, 1892, the showing was remarkably good in view of the fact that the grain, hog and provision movement fell off and the movement of cotton in the South was greatly contracted. The Presidential election also curtailed the volume of merchandise freight to a considerable extent.

In December, 1892, while the gross increase was still fair, comparatively speaking, there was a marked decline in the net. During the month the Southern roads suffered a heavy diminution in the cotton movement and the Western roads a falling off in the hog and wheat movements, and the comparison was made with a very heavy month of the previous year.

In January the weather was very severe. Snow blockades and low temperature had the effect of materially reducing net earnings. The decrease in net was 9 per cent. against an increase of 1.38 per cent. in gross earnings. The Trunk line roads suffered the most severely owing to their territorial situation, while the Southern and Southwestern roads made gains.

In February the weather was still worse, while the falling off in the grain movement heightened the percentage loss. This was a very bad month for net earnings, the decrease being 16.54 against 3.66 in gross. In April curtailed cotton and grain movement resulted in an unfavorable showing.

The net showing in May was exceptionally good being 15.45 per cent. increase against a gross increase of 7.8. The month was compared with a month in 1892 in which floods greatly reduced earnings. It also had one more working day. The Ohio roads suffered owing to the coal miners' strike. The gains were the heaviest on the Pennsylvania, which were near a million in gross;

COMPARATIVE TABLE OF GROSS AND NET EARNINGS.

| Month. | Number roads. | Gross. | | Change. | Per cent. | Net. | | Change. | Per cent. |
|---|---|---|---|---|---|---|---|---|---|
| 1892. | | 1892. | 1891. | | | 1892. | 1891. | | |
| November | 131 | 66,322,782 | 65,129,848 | +1,192,934 | +1.83 | 23,137,026 | 23,695,463 | +558,434 | +2.36 |
| December | 124 | 62,643,259 | 61,501,607 | +1,141,652 | +1.8 | 20,794,504 | 20,739,852 | + 54,652 | + .26 |
| 1893. | | 1893. | 1892. | | | 1893. | 1892. | | |
| January | 125 | 55,860,995 | 55,100,108 | + 760,887 | +1.38 | 13,361,256 | 14,682,255 | −1,320,999 | − 9.0 |
| February | 134 | 54,892,473 | 56,984,473 | −2,092,000 | −3.66 | 14,115,141 | 16,912,550 | −2,797,409 | −16.54 |
| March | 137 | 61,895,305 | 58,652,387 | +3,242,918 | +5.50 | 18,657,481 | 18,428,103 | + 229,378 | + 1.2 |
| April | 131 | 56,001,070 | 54,148,665 | +1,852,405 | +3.42 | 16,367,603 | 16,018,322 | + 349,281 | + 2.11 |
| May | 131 | 65,018,717 | 60,314,952 | +4,703,765 | +7.8 | 19,278,127 | 16,697,484 | +2,580,143 | +15.45 |
| June | 122 | 59,169,146 | 57,755,984 | +1,713,162 | +2.96 | 17,774,669 | 16,738,759 | +1,035,910 | + 6.18 |
| July | 129 | 56,824,847 | 59,720,176 | −2,895,329 | −4.85 | 16,250,647 | 17,541,083 | −1,290,436 | − 7.36 |
| August | 130 | 54,737,181 | 63,126,250 | −8,389,069 | −13.29 | 17,495,208 | 21,599,375 | −4,104,067 | −19.0 |
| September | 131 | 58,195,908 | 64,917,022 | −6,721,642 | −9.77 | 21,578,744 | 23,643,067 | −2,064,323 | − 8.7 |
| October | 130 | 64,022,923 | 67,396,829 | −3,373,906 | −2.38 | 25,329,948 | 24,998,635 | + 331,313 | + 1.3 |
| November | 130 | 46,610,334 | 49,931,745 | −3,321,411 | −6.65 | ..... | ..... | ..... | .... |
| December | 127 | 40,319,046 | 46,763,383 | −6,474,337 | −13. | ..... | ..... | ..... | .... |

Burlington one-third of a million; Illinois Central one-third of a million. The Trunk line group showed a gain of 1¼ million. Southern Pacific, Atchison and Baltimore & Ohio showed heavy increases. The Northwestern group showed 40.58 per cent. improvement. The losses were large on the Erie,

In June the net increase was 6.18 against a gross increase of 2.96. Union Pacific lost half a million in gross and a trifle more in net. This was greatly due to decline in the silver production. Reading lost $107,000 gross; Louisville, $108,000; Southern Pacific, $34,000; Erie, $74,000, and Burlington, $33,000. Pennsylvania increased $673,000 gross and $674,000 net. Illinois Central, on account of the Fair traffic, gained $693,000 gross and $694,000 net. St. Paul gained $153,000 gross and $203,000 net. The Trunk line group showed a gain of 20.9 per cent. The Middle Western group showed 47.9 per cent. gain and the Middle group 34.84 per cent. gain.

The panic month of July showed a greater decrease in net than gross, indicating that the economies had not yet taken effect. The effect of the financial disturbances were not so much felt or reflected until the succeeding months. In this month Northern Pacific and Missouri Pacific were the heaviest losers. East of the Mississippi and north of the Ohio the roads suffered less from the effects of the crisis than other sections. This is due to passenger earnings on World's Fair traffic.

In August we had the greatest decrease for the year so far as is known. It amounted to 19 per cent. in net and 13.29 per cent. in gross. Northern Pacific and Missouri Pacific did not report their net earnings, and consequently are not included in the summary. The actual decreases of the 130 roads given and those not reporting amounted to about $12,000,000. Although the World's Fair traffic swelled the earnings, it has been estimated that without these passenger earnings the loss would have been $20,000,000 gross, but this is of course a mere estimate.

In September economies began to have their full effect. Thus Pennsylvania lost $1,115,000 gross and but $161,000 net. St. Paul lost $233,000 gross and had an actual small increase in the net. Missouri Pacific lost $457,000 gross and $43,000 net. Louisville lost $124,000 gross and but $24,000 net. The Middle Western group, owing to World's Fair traffic, increased. The Northwestern group lost 4.04 per cent. Conditions in October were very much the same as those in September, with bad gross earnings, but the economies more pronounced and the policy of retrenchment extended to every department.

The Bigbee & Warrior Rivers Packet Company has secured a favorable decision in the United States Circuit Court for the Southern District of Alabama, in its suit against the Mobile & Ohio for unjust discrimination in freight rates. This suit was decided by Judge Toulmin on Dec. 30, and it has been briefly reported in the daily papers, but the details as stated in these reports are unintelligible and in some of the newspapers the headlines were misleading, carrying the idea that the Mobile & Ohio had won the suit. The facts in the case were very simple and it seems strange that it should have been taken into court at all. The packet company brought cotton down the river to Mobile from Demopolis, 125 miles north of there, and there offered it to the railroad for transportation by rail westward to New Orleans, delivering the cotton at the regular freighthouse and tendering money for the freight charges at the tariff rate, 80 cents a bale; but the road demanded $1.25 a bale, on the ground that the circumstances and conditions under which the cotton was delivered were different from those under which ordinary shipments were tendered. It appears that the reason for this action was that the road had agreed with competing railroad lines that the through rate from the territory north of Mobile, that in which Demopolis is situated, should be maintained at $1.25 (or some other rate higher than that from Mobile); but there was no through billing arrangement with the packet line nor, so far as appears, with any boat line on this river. The judge decides, of course, that all cotton brought to the freighthouse at Mobile should be received on equal terms unless substantial dissimilarity of circumstances is shown to exist, and he naturally finds that the dissimilarity in this case is exceedingly unsubstantial. This cotton came from Demopolis, it is true, he says; but all cotton shipped at Mobile comes from somewhere; it is not grown in the city. Aside from the fact that 99 out of every 100 men, judges or jurymen, would decide the question in this way, the universal practice of railroad officers in making rates, from time immemorial, ought to have warned the defendant of the futility of his argument. The liability of a passenger to terminate his journey and immediately begin a new one, for the sake of taking advantage of an unusually low tariff, is one of the things which always has to be guarded against in making specially low rates, and the right to do so is one which no one attempts to deny. The same is true as regards freight; so much so that railroads have very generally acquiesced in the custom by allowing freight agents to act for the sender in reconsigning shipments. When a shipper desires to take advantage, on the same terms that are accorded to a hundred others, of a low rate that has been publicly advertised, the railroad manager who desires to choke him off had better invoke the aid of almost anything rather than a statute or a judge.

A Ride from New York to Chicago on the Locomotive of the Exposition Flyer is the title of an interesting article by Cy Warman in the January number of *McClure's Magazine*. The author, whose every-day name is Cyrus C. Warman, is a man of some reputation as a writer, and was formerly a locomotive engineer on the Denver & Rio Grande, and his story of this ride will be of interest to railroad men, while at the same time he has doubtless put in sufficient color to please the lay reader. Although Mr. Warman is an old engineer he confesses that it did not seem quite right to run at a mile a minute through the apparently sharp curves in the track at the entrance and at the end of middle sidings. It appears, however, that 60 miles an hour was not a very familiar speed on the crooked roads of Colorado. The account of the work of the engineer and fireman on the flyer is quite satisfactory. For a good deal of the way their task was not unusual, and so there is not much to say. The most difficult part of the journey was from Albany to Syracuse, where there was an extra car and where some little difficulty with the furnace door and the gage lamp bothered the fireman so that he was unable to keep the steam quite up to the point; with these and other little mishaps they were six minutes late into Syracuse. The article is filled out with Mr. Warman's past experiences, among which is a vivid account of how it feels to try to run a locomotive when you have been 25 or 30 hours without sleep. He says that out in the mountains the engineers used to make 60 days in a month sometimes, and one young man "would threaten to put himself into the hands of a receiver unless he could make at least 40 days in a month"; 50 days, however, was what he called a fair business; but he used himself up in three years. Mr. Warman thinks that most engineers would reverse their engine in the face of danger, even if they had been told that the quickest stop could be made by applying the brakes without reversing. He has never heard of an engineer who in time of danger left the cab without first making an effort to stop the train. An artist went along with Mr. Warman, but of course he could not see much at night, and his pictures are mostly of scenes inside the train, or subjects somewhat remotely connected with the text. There are a portrait of Mr. Warman, two or three views inside the cab, and portraits of Vice-President Webb and Superintendent of Motive Power Buchanan, of the New York Central. The most striking picture is a night view near a block signal tower on one of the four-track divisions of the New York Central.

The Emperor Ferdinand Northern Railroad, of Austria, adopted April 1, 1891, the zone tariff of the Austrian State Railroads, which, it should be remembered, is very different from the Hungarian zone tariff. The number of passengers and the earnings from them on the Northern Railroad have been:

| Year. | No. Passengers. | Earnings. |
|---|---|---|
| 1890 | 5,688,351 | $2,509,298 |
| 1891 | 6,960,412 | 2,372,659 |
| 1892 | 7,678,839 | 2,415,400 |

Thus, the number of passengers increased 1,272,061, or 22 per cent., from 1890 to 1891, while the passenger earnings decreased $136,639, or 5.4 per cent. From 1891 to 1892 there was a further increase of 718,427 (10⅓ per cent.) in the number of passengers, and a gain of $42,741 (1.8 per cent.) in the earnings. Compared with 1890, 1892 shows 35 per cent. more passengers and 3¾ less passenger earnings. From 1887 to 1890, without any change in rates, the number of passengers increased 45 per cent. Working expenses on the road were $624,000 more in 1892 than in 1890, which is attributed almost wholly to the larger passenger traffic, freight traffic not having grown materially. This indicates a loss of $666,700 in *profits*, due to the reduced passenger rates, which is probably as much as one-half of the passenger net earnings in 1890. The data on hand, however, are not sufficient to warrant a statement of this as undoubted fact.

## TRADE CATALOGUES.

*Rogers Locomotive Company*, of Paterson, N. J., has recently issued a handsome catalogue of 117 pages, finely printed on heavy paper and giving illustrations of the standard types of locomotive built by that company. Forty-five of these plates are given, each accompanied by tables giving the principal dimensions and capacity of the locomotive. The frontispiece is a portrait of Thomas Rogers, the founder of the company, and as a preface there is given a short historical sketch showing the development of the works since their establishment in 1831 and the changes in name and management up to 1893, in which year the Rogers Locomotive & Machine Works, which had, since 1856, been under the management of J. S. Rogers, became the Rogers Locomotive Company, with Robert S. Hughes as President and Reuben Wells as Superintendent. Two engravings are given showing the appearance of the works in 1832 and at the present time. Following a standard specification blank of the company, there is a short chapter, compiled from various authorities and showing the methods usually employed for calculating the tractive power and adhesion of locomotives, the values of the various elements that make up the total of train resistance, and rules for calculating the capacity of a locomotive on various grades and curves.

This is a very interesting and useful compilation, and it is to be regretted that the old formula, $\frac{V^2}{171} + 6$, is given for the resistance of trains on straight, level track. While not far from correct at speeds under 60 miles per hour, it is hopelessly inaccurate and misleading at higher speeds (see *Railroad Gazette*, March 18, 1892). It has been pretty conclusively determined by recent experiments and from the results of fast runs made within the last few years that train resistance does not increase with the square of the speed.

On page 15 is a table showing the proportion of the weight on drivers to the total weight of locomotives of different classes, and varying from 64 per cent. for an eight-wheel American type locomotive with firebox between the two axles, to 89 per cent. for a consolidation locomotive with firebox over the back axle only.

*Valentine & Co.*, manufacturers of varnishes, issue a pocket calendar for 1894, being also a memorandum tablet. The covers are celluloid, and show a *fac-simile* of a World's Fair "official ribbon" giving a list of the articles and displays for which the company received a premium from the Columbian Exposition.

## Railroad Matters in Chicago.

*Freight Traffic.*—The volume of inbound freight traffic delivered here by the Western railroads during the past week, was a gratifying surprise. As will be seen by the tables given below the total deliveries for the week by the 11 leading Granger lines centering here were 158,083 barrels of flour and 4,499,000 bushels of grain, compared with 81,875 barrels of flour and 3,602,000 bushels of grain the week ending Jan. 14, 1893; 157,668 barrels of flour and 2,596,000 bushels of grain the corresponding time in 1892. There was also a large increase in livestock freights over the week immediately preceding. The volume of miscellaneous produce freight was also quite equal to anticipations and compared very favorably with the same week last year. It is intimated in grain handling circles that the surprisingly free arrivals of grain the past week were contracted for in the interior last month when shippers east from Chicago were obtaining a 15 cent rate per 100 lbs. to the seaboard, and that a let-up in arrivals may now be looked for. This statement also receives some color from the fact that the shipments continue heavy. But it is claimed by the railroad officers that 15 cent contracts expired with last year, and that all business since then has paid the advanced tariff rates announced Jan. 1. It seems unlikely, however, that the recent free movement of grain from the interior will continue, as it has few precedents during the winter months; and inasmuch as prices are low and as country dealers can contract their grain for May delivery at figures that pay well for holding it in their home cribs until spring, the chances are largely in favor of such action. The latest advices from Minnesota and the Dakotas also go far to support recent statements that the wheat traffic of the roads traversing those sections will further diminish because of the small supply still in the hands of producers and country dealers. Experts in the livestock trade are widely divergent in their estimates of the business that the railroads are likely to derive from that source the remainder of the winter and early spring months. The movement of merchandise freight to the interior showed a small increase, and a further steady growth in that class of business is confidently predicted. Coal increased 7,228 tons, but the lumber traffic failed to reach anticipations. The volume of most classes of other heavy freights was also moderate, and the general aggregate of the week's business was not up to that of the same time last year.

The following shows the deliveries of grain at Chicago by the leading Western railroads for the week ending

Jan. 13 and for the corresponding time the three preceding years:

| | 1894. | 1893. | 1892. | 1891. |
|---|---|---|---|---|
| | Grain. | Grain. | Grain. | Grain. |
| | Bush. | Bush. | Bush. | Bush. |
| N. W. | 1,030,000 | 747,000 | 407,000 | 336,000 |
| Ill. Cent. | 604,000 | 368,000 | 208,000 | 270,000 |
| C., R. I. & P. | 539,000 | 375,000 | 194,000 | 92,000 |
| C., B. & Q. | 1,115,000 | 713,000 | 710,000 | 149,000 |
| C. & Alton | 158,000 | 74,000 | 105,000 | 19,000 |
| C. & E. Ill. | 90,000 | 116,000 | 45,000 | 82,000 |
| C., M. & St. P. | 475,000 | 655,000 | 626,000 | 421,000 |
| Wabash | 203,000 | 89,000 | 39,000 | 159,000 |
| C. & Gr'd W. | 173,000 | 281,000 | 156,000 | 164,000 |
| A., T. & S. Fe | 74,000 | 184,000 | 105,000 | 37,000 |
| L., N. A. & C. | 6,000 | ..... | 1,000 | 1,000 |
| Totals | 4,497,000 | 3,602,000 | 2,596,000 | 1,730,000 |

The following shows the deliveries of flour at Chicago by the 11 leading Western railorads for the week ending Jan. 13 and comparisons with the three preceding years:

| | 1894. | 1893. | 1892. | 1891. |
|---|---|---|---|---|
| | Flour. | Flour. | Flour. | Flour. |
| | Bbls. | Bbls. | Bbls. | Bbls. |
| N. W. | 29,291 | 18,242 | 74,979 | 25,275 |
| Ill. Cent. | 300 | ..... | ..... | ..... |
| C., R. I. & P. | 75,400 | 6,000 | 1,625 | 2,130 |
| C., B. & Q. | 11,500 | 14,609 | 32,095 | 32,720 |
| C. & Alton | 1,050 | 4,050 | 2,900 | 800 |
| C. & E. Ill. | 300 | 150 | ..... | ..... |
| C., M. & St. P. | 20,850 | 22,350 | 33,550 | 34,090 |
| Wabash | ..... | 1,200 | 625 | 125 |
| C. & G. W. | 19,391 | 14,824 | 12,584 | ..... |
| A., T. & S. Fe | ..... | 450 | 210 | 124 |
| L., N. A. & C. | ..... | ..... | ..... | 10 |
| Totals | 158,082 | 81,875 | 157,668 | 95,274 |

The following table shows the total number of cars of livestock received at Chicago for 1893, with comparisons with the three preceding years, and the number delivered by each of the railroads mentioned:

| Railroads. | 1893. | 1892. | 1891. | 1890. |
|---|---|---|---|---|
| | Cars. | Cars. | Cars. | Cars. |
| A., T. & S. Fe | 14,519 | 19,929 | 18,909 | 24,184 |
| C., B. & Q. | 65,115 | 73,655 | 74,316 | 80,430 |
| C., R. I. & P. | 29,533 | 33,174 | 28,193 | 30,233 |
| C. & N. West | 48,049 | 55,412 | 52,653 | 48,582 |
| C., M. & St. P. | 34,597 | 40,628 | 37,919 | 40,509 |
| C. & E. Ill. | 4,748 | 4,675 | 4,867 | 5,248 |
| C. & Alton | 24,022 | 22,505 | 23,192 | 22,008 |
| Ill. Cent. | 18,123 | 23,582 | 24,934 | 22,765 |
| Wabash | 19,041 | 18,879 | 17,880 | 19,022 |
| C. & Gt. W. | 8,201 | 9,401 | 13,071 | 11,465 |
| L., N. A. & C. | 1,465 | 1,806 | 1,592 | 1,126 |
| Wis. Cent | 3,271 | 3,347 | 3,761 | 2,425 |
| L. S. & M. So. | 421 | 429 | 475 | 575 |
| Mich. Cent. | 542 | 512 | 741 | 813 |
| P. C., C. & St. L. | 1,171 | 828 | 963 | 810 |
| P., Ft. W. & C. | 271 | 338 | 333 | 381 |
| N. Y., C. & St. L. | 268 | 199 | 214 | 218 |
| C. & Grd. Tr. | 158 | 174 | 253 | 281 |
| Balt. & Ohio | 171 | 238 | 227 | 276 |
| C. & Erie | 213 | 190 | 173 | 216 |
| Total cars | 273,932 | 309,901 | 304,706 | 311,557 |

RECAPITULATION.

The number of head of each kind of stock contained in the above statement of cars was as follows:

| | 1893. | 1892. | 1891. | 1890. |
|---|---|---|---|---|
| Cattle, No. | 3,133,406 | 3,571,769 | 3,250,359 | 3,484,280 |
| Calves, " | 210,557 | 197,576 | 205,383 | 175,025 |
| Hogs, " | 6,057,278 | 7,714,434 | 8,600,805 | 7,663,828 |
| Sheep, " | 3,031,174 | 2,145,076 | 2,153,537 | 2,182,667 |
| Horses, " | 82,492 | 86,998 | 94,396 | 101,576 |

The following exhibits the total number of carloads of livestock shipped from Chicago during the past four years, and the proportion carried by each of the eight eastbound trunk lines mentioned:

| Railroads. | 1893. | 1892. | 1891. | 1890. |
|---|---|---|---|---|
| B. & Ohio | 4,166 | 5,228 | 5,043 | 7,819 |
| C. & Erie | 2,983 | 2,965 | 3,827 | 1,663 |
| C. & G. Trunk | 13,845 | 15,415 | 12,350 | 17,057 |
| Lake Shore & M. So. | 24,097 | 24,548 | 22,584 | 18,486 |
| Mich. Cent. | 8,263 | 11,443 | 9,587 | 14,747 |
| N. Y., C. & St. L. | 3,911 | 13,074 | 17,623 | 18,031 |
| P., C., C. & St. L. | 1,372 | 2,248 | 1,437 | 1,483 |
| P., Ft. W. & C. | 11,374 | 13,806 | 14,475 | 17,312 |
| Total East. roads | 70,011 | 88,727 | 86,926 | 96,598 |
| Total West. roads | 9,274 | 10,674 | 10,573 | 8,841 |
| Grand total cars | 79,285 | 99,601 | 97,499 | 105,439 |

The description of livestock shipped was as follows:

| | 1893. | 1892. | 1891. | 1890. |
|---|---|---|---|---|
| Cattle, No. | 900,183 | 1,121,675 | 1,666,264 | 1,260,309 |
| Calves, " | 13,832 | 31,044 | 48,331 | 61,466 |
| Hogs, " | 2,149,410 | 2,946,145 | 2,962,514 | 1,985,700 |
| Sheep, " | 442,865 | 483,368 | 688,205 | 929,854 |
| Horses, " | 70,011 | 74,368 | 87,273 | 94,362 |

*Passenger Traffic.*—Passenger officers, while generally talking blue regarding their earnings, admitted that there were slight signs of improvement in both through and local traffic, the latter being almost if not entirely confined to interior points; the travel between this city and near stations showing little if any increase over the low average of the closing weeks in December and the opening one the current month. The general complaint is that the strictly local trains are making a poor show of winter earnings compared with the corresponding time last year.

*Track Elevation.*—The new mayor, who started out with very radical views regarding the elevation of railroads tracks within the city limits, seems to have had his ideas materially modified by a slight investigation of the question. In fact he now expresses the opinion that it is entirely unnecessary and impractical to meddle with the tracks in a large section of the West Division of the city where the existing ordinance provides for an early elevation. He also finds that in other portions the ordinance is defective and utterly impractical, hence a new one must be passed ere any work of consequence is done. In fact a thorough examination of all the tracks must be made by expert engineers and an ordinance drawn that will be in every respect practical for the localities. During the past week a number of conferences were held between the city engineering department and the representatives of the Chicago, Rock Island & Pacific and the Lake Shore, and an officer of the first-mentioned company stated that, while he was not at liberty to report the substance of the meetings in detail, he would say that the prospects for agreeing on a plan of track elevation and subways or depressions within a certain district south of Sixteenth street were much better than they had hoped for at this early date. North of the street mentioned the city engineers agree with those of the railroad companies that elevation was impractical because of the multitude of tracks necessary for the business. The chief question now at issue is, Who shall be responsible for damages to abutting property?

CHICAGO, Jan. 15, 1894.

## The Railroad Rate Question in England.

BY W. M. ACWORTH.

Some months back I told in the *Railroad Gazette* the tale of our latest English experiences in regulating railway rates by Act of Parliament. I sketched the history of the recent revision of statutory maximum rates, showing how what began as a process of simplification of maximum powers of charge had been gradually perverted into a machinery for the reduction of actual rates. Of course the new maxima, though lower than the then existing actual rates at many points, were higher than the existing actual rates at very many more points; and it was open to the companies to endeavor to recoup their losses in the one class of cases by increasing their rates on the other class. Being, as a distinguished railway authority pertinently remarked the other day, not philanthropic undertakings, but commercial enterprises, the railway companies naturally endeavored to recoup themselves. Accordingly, on Jan. 1, 1893, the day on which the new Acts of Parliament went into operation, side by side with a number of reduced rates, as to which nothing was heard in public, there appeared a large number of increased rates, as to which the traders expressed their disgust in the loudest possible language. Popular feeling was greatly excited; the House of Commons resolved that "the revised railway rates are most prejudicial to the industries and agricultural and commercial interests of the country," and appointed a committee "to inquire into the manner in which the railway companies have exercised the powers conferred upon them by the Railway Rates and Charges Order Confirmation Acts (1891 and 1892), and to consider whether it is desirable to adopt any other than the existing means of settling differences arising between the companies and the public with respect to the rates and conditions of charge for the conveyance of goods, and to report what means they recommend."

The committee so appointed met in April and took evidence from traders, railroad managers and others, sitting twice a week during May, June, July, and part of August. When the House reassembled in October for an autumn session, they met again to consider their report, and within the last few days this report has been presented to Parliament and published. It consists, broadly, of two parts. Part I. deals with the history of the past. Part II. contains recommendations for the future. With Part I. I need only deal very briefly. Whether the English companies exercised wisely or foolishly the powers conferred upon them is a matter in which American readers can only take a very faint interest. Any one, moreover, who cares to go into the question seriously will not be content to take his opinion on this subject ready-made from the committee appointed in a hurry by a government and a House of Commons whose main idea was that "something must be done" to satisfy public opinion.

But it may be said in very few words that the committee's version of the history amounts to a formidable indictment of the action of the railway companies. The fact that the maximum rates were reduced by the new acts below the level of the rates which the companies were at that moment in many instances charging proves, in the opinion of the committee, that these latter were deliberately adjudged by Parliament to be excessive and improper to be charged. Evidently, therefore, the companies had no right to raise rates elsewhere to compensate them for the compulsory abandonment of these extortionate rates which never ought to have been charged. It is true that Parliament did in many instances leave to the companies a margin between the rates which they had hitherto been charging and the new stationary maxima. But this margin was given, not in order that the companies might be in a position to adopt a policy of recoupment, but in order to meet certain contingencies, such as a rise in the price of materials or in wages, and these contingencies had not occurred when the increased rates were put in force in January last. Further, even had a recoupment policy been in any event justifiable, the companies were in honor bound not to adopt it in this instance, as their representatives had explicitly given Parliament and the public to understand that no such policy was in contemplation or would, in fact, be resorted to. Such is in outline the outspoken condemnation of the Parliamentary committee for the action of our railway companies. How far, if at all, it is justified by the facts of the case I will not, for reasons I have already given, stop to inquire. The fact that the sentiment, if I may so call it, of the committee is so strongly against the companies makes, to my mind, the second part of their report all the more interesting,

Called on to report what means, if any, they recommend to prevent a recurrence of this alleged misconduct, they recommend—practically nothing. It will be remembered that we in England have a duplex machinery for settling differences between railway companies and their customers. First, there is a department of the Board of Trade which has powers of investigating and reporting on alleged grievances, practically identical with, as they were copied from, the powers of your Massachusetts Railway Commission. Secondly, we have a Railway Commission of our own, which ranks as a regular court of law, but whose power in the matter of rates is limited to cases of discrimination and undue preference, and does not go to dealing with rates which are objected to as being excessive in themselves. Further, our companies are under statutory obligations to give a fortnight's notice of any proposed increase in rates. The committee make one small suggestion. In their opinion the law should provide that where (1) a company increases a rate, and (2) a trader complains to the Board of Trade that the increase is unreasonable, and where (3) as the result of this complaint an amicable settlement is not come to, then (4) the trader should be at liberty to appeal to the Railway Commission, which should allow or disallow the increase as it thinks proper. Moreover, the committee would make this proposed legislation so far retrospective that increases from January, 1894, should be regarded as new increases.

The only other recommendations of the committee deal with the constitution of the Railway Commission itself. That body consists at present of a judge of the High Court, who presides, and two laymen, appointed for life, one of whom is required to be "of experience on railways." The committee consider that the second lay commissioner should be "experienced in trade," and that these appointments should not be for life, but for a term of years. Further, the committee propose to adopt the rule both of your Inter-State Commerce Commission and our own Parliamentary Committee on Private Bills, and to leave each side to pay its own costs before the Railway Commission instead of costs being awarded, as in ordinary law court, to the successful litigant.

Much more remarkable than the recommendations of the committee are, however, the things that it has refused to recommend. The committee was, as I have said, distinctly radically-minded, and strongly prepossessed against the railway companies. But, when invited to change the powers of the Board of Trade from powers which, in Mr. Charles Francis Adams' phrase, 'mean publicity" into powers which "mean the constable," it flatly refused. "To give to the Board of Trade the power of enforcing its decisions would . . . be altogether opposed to the essential idea of conciliation. Your committee also cannot think it would be desirable or expedient to give to an administrative department of the government, responsible to Parliament, the power of deciding in any or every case what should be the rates for the conveyance of goods or other matters in dispute." Again, it was urged that the Board of Trade should appoint an arbitrator to decide rate cases; that the commissioners should be empowered to sit singly, with or without assessors; that they should delegate less important cases to the decision of their registrar; but the committee would have nothing to do with any one of these proposals. Further, though a majority of the members are followers of Mr. Gladstone, a motion favoring the establishment of a local railway tribunal for Ireland found only two supporters. Evidently one would be justified in saying that their few months' experience has taught the committee that railway rate questions are not quite so simple of solution as the outside public still fondly imagines.

One word more. The wisest passage in the published proceedings of the committee is not to be found in the report at all, but in the appendix. It is a new paragraph, suggested by Sir Bernhard Samuelson, who has been long and honorably distinguished as a moderate and reasonable railway reformer, but unfortunately not accepted by the committee. It runs as follows: "Care will, however, be necessary in any legislation intended to give effect to these proposals, not to make it applicable to the raising of rates which may have been reduced by the railway companies, merely by way of experiment in the expectation of developing traffic, and which they may find it necessary to restore to their previous level, otherwise great discouragement will be given to any experimental reductions, which it is evidently the interest of traders to encourage." Those who know most of the inside workings of railway policy at the present moment best know how real and how pressing is the danger which Sir Bernhard Samuelson foreshadowed.

## Safe Loads, in Pounds, for Yellow Pine Struts.

Computed from the Formula $1000 - 10\frac{l}{d}$. $l$ = length in inches $d$ = smaller diameter in inches. This is approximately the same with a factor of safety of 4, as the Formula $4250 - 43.3\frac{l}{d}$, which was obtained by plotting all experiments obtainable, on full-sized sticks, made with the Government Testing Machine at Watertown Arsenal and represents the average of all the lowest breaking weights in each set of tests.

J. H. Stanwood, Mass. Institute of Technology, 1891.

| Size | 6 Ft. | 8 Ft. | 10 Ft. | 12 Ft. | 14 Ft. | 16 Ft | 18 Ft. | 20 Ft. |
|---|---|---|---|---|---|---|---|---|
| 4x4 | 13 100 | 12 200 | 11 200 | | | | | |
| 4x6 | 19 700 | 18 200 | 16 800 | | | | | |
| 4x8 | 26 200 | 24 300 | 22 400 | | | | | |
| 4x10 | 32 800 | 30 400 | 28 000 | | | | | |
| 4x12 | 39 400 | 36 500 | 33 600 | | | | | |
| 6x6 | 31 800 | 30 200 | 28 800 | 27 400 | 25 900 | 24 500 | | |
| 6x8 | 42 300 | 40 300 | 38 400 | 36 500 | 34 600 | 32 600 | | |
| 6x10 | 52 800 | 50 400 | 48 000 | 45 600 | 43 200 | 40 800 | | |
| 6x12 | 63 400 | 60 500 | 57 600 | 54 700 | 51 800 | 49 800 | | |
| 6x14 | 74 000 | 70 600 | 67 200 | 63 800 | 60 500 | 57 100 | | |
| 6x16 | 84 500 | 80 600 | 76 800 | 73 000 | 69 100 | 65 300 | | |
| 8x8 | 58 200 | 56 300 | 54 400 | 52 500 | 50 600 | 48 600 | 46 700 | 44 800 |
| 8x10 | 72 800 | 70 400 | 68 000 | 65 600 | 63 200 | 60 800 | 58 400 | 56 000 |
| 8x12 | 87 400 | 84 500 | 81 600 | 78 700 | 75 800 | 73 000 | 70 100 | 67 200 |
| 8x14 | 101 900 | 98 600 | 95 200 | 91 800 | 88 500 | 85 100 | 81 800 | 78 400 |
| 8x16 | 116 500 | 112 600 | 108 800 | 105 000 | 101 100 | 97 300 | 93 400 | 89 600 |
| 8x18 | 131 000 | 126 700 | 122 400 | 118 100 | 113 800 | 109 400 | 105 100 | 100 800 |
| 10x10 | 92 800 | 90 400 | 88 000 | 85 600 | 83 200 | 80 800 | 78 400 | 76 000 |
| 10x12 | 111 400 | 108 500 | 105 600 | 102 700 | 99 800 | 97 000 | 94 100 | 91 200 |
| 10x14 | 129 900 | 126 600 | 123 200 | 119 800 | 116 500 | 113 100 | 109 800 | 106 400 |
| 10x16 | 148 500 | 144 600 | 140 800 | 137 000 | 133 100 | 129 300 | 125 400 | 121 600 |
| 10x18 | 167 000 | 162 700 | 158 400 | 154 100 | 149 800 | 145 400 | 141 100 | 136 800 |
| 12x12 | 135 400 | 131 500 | 129 600 | 126 700 | 123 800 | 121 000 | 118 100 | 115 200 |
| 12x14 | 157 900 | 154 600 | 151 200 | 147 800 | 144 500 | 141 100 | 137 800 | 134 400 |
| 12x16 | 180 500 | 176 600 | 172 800 | 169 000 | 165 100 | 161 300 | 157 400 | 153 600 |
| 12x18 | 203 000 | 198 700 | 194 400 | 190 100 | 185 800 | 181 400 | 177 100 | 172 800 |
| 14x14 | 185 900 | 181 600 | 179 200 | 175 800 | 172 500 | 169 100 | 165 800 | 162 400 |
| 14x16 | 212 500 | 208 600 | 204 800 | 200 900 | 197 100 | 193 300 | 189 400 | 185 600 |
| 14x18 | 239 000 | 234 700 | 230 400 | 226 100 | 221 800 | 217 400 | 213 100 | 208 800 |
| 16x16 | 244 500 | 240 600 | 236 800 | 233 000 | 229 100 | 225 300 | 221 400 | 217 600 |
| 16x18 | 275 000 | 270 700 | 266 400 | 262 100 | 257 800 | 253 400 | 249 100 | 244 800 |
| 18x18 | 311 000 | 306 700 | 302 400 | 298 100 | 293 800 | 289 400 | 285 100 | 280 800 |
| | 6 Ft. | 8 Ft. | 10 Ft. | 12 Ft. | 14 Ft. | 16 Ft. | 18 Ft. | 20 Ft. |

## Safe Loads, in Pounds, for White Pine Struts.

Computed from the Formula $800 - 10\frac{l}{d}$, $l$ = length in inches, $d$ = smaller diameter in inches. This formula was obtained by plotting all experiments on full size pieces made at Watertown Arsenal and represents the average of all the lowest breaking weights in each set of tests.

James H. Stanwood,
Mass. Institute of Technology.

| Size | 6 ft. | 8 ft. | 10 ft | 12 ft. | 14 ft. | 16 ft. | 18 ft. | 20 ft. |
|---|---|---|---|---|---|---|---|---|
| 4x4 | 9 900 | 9 000 | 8 000 | | | | | |
| 4x6 | 14 900 | 13 400 | 12 000 | | | | | |
| 4x8 | 19 800 | 17 900 | 16 000 | | | | | |
| 4x10 | 24 800 | 22 400 | 20 000 | | | | | |
| 4x12 | 29 800 | 26 900 | 24 000 | | | | | |
| 6x6 | 24 500 | 23 000 | 21 600 | 20 200 | 18 700 | 17 300 | | |
| 6x8 | 32 600 | 30 700 | 28 800 | 26 900 | 25 000 | 23 000 | | |
| 6x10 | 40 800 | 38 400 | 36 000 | 33 600 | 31 100 | 28 800 | | |
| 6x12 | 49 000 | 46 100 | 43 200 | 40 300 | 37 400 | 34 500 | | |
| 6x14 | 57 100 | 53 800 | 50 400 | 47 000 | 43 700 | 40 300 | | |
| 6x16 | 65 300 | 61 400 | 57 600 | 53 800 | 49 900 | 46 100 | | |
| 8x8 | 45 400 | 43 500 | 41 600 | 39 700 | 37 800 | 35 800 | 33 900 | 32 000 |
| 8x10 | 56 800 | 54 400 | 52 000 | 49 600 | 47 200 | 44 800 | 42 400 | 40 000 |
| 8x12 | 68 200 | 65 300 | 62 400 | 59 500 | 56 600 | 53 800 | 50 900 | 48 000 |
| 8x14 | 79 500 | 76 200 | 72 800 | 69 400 | 66 100 | 62 700 | 59 400 | 56 000 |
| 8x16 | 90 900 | 87 000 | 83 200 | 79 400 | 75 500 | 71 700 | 67 800 | 64 000 |
| 8x18 | 102 200 | 97 900 | 93 600 | 89 300 | 85 000 | 80 600 | 76 300 | 72 000 |
| 10x10 | 72 800 | 70 400 | 68 000 | 65 600 | 63 200 | 60 800 | 58 400 | 56 000 |
| 10x12 | 87 400 | 84 500 | 81 600 | 78 700 | 75 800 | 73 000 | 70 100 | 67 200 |
| 10x14 | 101 900 | 98 600 | 95 200 | 91 800 | 88 500 | 85 100 | 81 800 | 78 400 |
| 10x16 | 116 500 | 112 600 | 108 800 | 105 000 | 101 100 | 97 300 | 93 400 | 89 600 |
| 10x18 | 131 000 | 126 700 | 122 400 | 118 100 | 113 800 | 109 400 | 105 100 | 100 800 |
| 12x12 | 106 600 | 103 700 | 100 800 | 97 900 | 95 000 | 92 200 | 89 300 | 86 400 |
| 12x14 | 124 300 | 121 000 | 117 600 | 114 200 | 110 900 | 107 500 | 104 200 | 100 800 |
| 12x16 | 142 100 | 138 200 | 134 400 | 130 600 | 126 700 | 122 900 | 119 000 | 115 200 |
| 12x18 | 159 800 | 155 500 | 151 200 | 146 900 | 142 600 | 138 200 | 133 900 | 129 600 |
| 14x14 | 146 700 | 143 400 | 140 000 | 136 600 | 133 300 | 129 900 | 126 600 | 123 200 |
| 14x16 | 167 700 | 163 700 | 160 000 | 156 100 | 152 300 | 148 500 | 144 600 | 140 800 |
| 14x18 | 188 600 | 184 300 | 180 000 | 175 700 | 171 400 | 167 000 | 162 700 | 158 400 |
| 16x16 | 193 300 | 189 400 | 185 600 | 181 800 | 177 900 | 174 100 | 170 200 | 166 400 |
| 16x18 | 217 400 | 213 100 | 208 800 | 204 500 | 200 200 | 195 800 | 191 500 | 187 200 |
| 18x18 | 246 200 | 241 900 | 237 600 | 233 300 | 229 000 | 224 600 | 220 300 | 216 000 |
| Size | 6ft. | 8ft. | 10ft. | 12ft. | 14ft | 16ft. | 18ft. | 20ft. |

### A Proposed Formula for White Pine Posts.*

An article by the present writer, entitled "A Proposed New Formula for Yellow Pine Posts," appeared in the *Railroad Gazette* of Jan. 29, 1892. It was a straight line formula of the form:

$$S = 4{,}250 - 43\frac{1}{3}\frac{l}{d}$$

representing the average of the lowest breaking values of a series of tests, made on *full size* sticks, at the Watertown Arsenal. The working formula}

$$s = 1{,}000 - 10\frac{l}{d}$$

was recommended.

$s$ = allowable stress per square inch,
$l$ = length of piece in inches,
$d$ = smaller diameter in inches,

assuming the factor of safety of 4¼ approx.

The object of the present article is to bring to notice a similar formula for *white pine posts*. As in the former case, the tests were made at the Watertown Arsenal on *full size* sticks, and each test has been plotted with the breaking load in lbs. per square inch for the ordinate and the ratio of $l$ to $d$ for the abcissa as shown in the cut. An average line for the lowest breaking loads in each set of tests has been drawn whose equation is

$$S = 3{,}150 - 40\frac{l}{d}.$$

Using a factor of safety of 4 we may write

$$s = 800 - 10\frac{l}{d}.$$

Of course any other factor of safety may be used, and if the formula of the style

$$S = \frac{k}{1 + \frac{1}{\alpha}\cdot\frac{l^2}{d^2}}$$

is preferred we may use for breaking loads

$$S = \frac{3200}{1 + \frac{1}{1200}\cdot\frac{l^2}{d^2}},$$

which gives very nearly the same results as the simpler form above.

Considerable search has been made for tests on *full size* posts of *oak* and *spruce*, but without success.

Judging from the compression tests on small size specimens, made at Watertown Arsenal, for the Tenth Census† and also from the results of tests on large size beams‡ made by Professor Lanza, and noted in his "Applied Mechanics," we may assume, in the absence of other information, that yellow pine and white oak have about the same value and that white pine and spruce also are nearly equal in strength, as posts.

The following is recommended for the allowable stresses per sq. in.:

Yellow pine or white oak } $s = 1{,}000 - 10\frac{l}{d}$

with a factor of safety of 4¼;

White pine or spruce } $s = 800 - 10\frac{l}{d}$

with a factor of safety of 4.

The tables herewith have been computed from the above formulas and may be found useful for reference; the yellow pine table is reproduced from the earlier article.

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*Instructor in Civ. Eng.,*
*Mass. Inst. of Tec'y.*
Dec. 26, 1893.




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| | Yellow pine. | White oak. | White pine. | Spruce. |
|---|---|---|---|---|
| †Av. value of tests in lbs. per sq. in. | 7,000 | 7,100 | 5,000 | 4,900 |
| ‡Av. value of tests in lbs. per sq. in. | 7,300 | 6,100 | 4,800 | 4,900 |

### Brass and Copper Tubes for Locomotive Boilers.

The specifications of the Antofagasta Railroad, Chili and Bolivia, S. A., in common with those of other railroads in South America still under the partial influence of English methods, call for locomotive boiler tubes to be of brass. A recent order for locomotives and extra parts was filled by the Baldwin Locomotive Works, and comprised three mogul and three consolidation locomotives, with extra brass tubes and 1,300 copper tubes, besides other items.

In the specifications, the Master Mechanic called attention to the difficulty experienced in the sagging of such tubes on engines in use, and called for "brazed tubes made from hard sheet brass." He also raised the query as to the advisability of introducing an intermediate stay sheet, but such suggestion was not considered as practicable by the Baldwin Locomotive Works, and was not followed in the construction of the locomotives.

We are indebted to Messrs. R. W. Hildreth & Co., Inspecting Engineers, for the following extract from their report on the inspection of these engines and tubes.

BRASS BOILER TUBES—2-IN. DIAMETER, NO. 12—B. W. G.

The specifications call for "brazed tubes made from hard sheet brass," and the complaint is that brass tubes now in use in locomotives tend to sag at the center. An effort was first made to carry out the letter of the specifications, and the leading manufacturers of tubes in this country were written; however, only one manufacturer would attempt to furnish brazed tubes, and he would not guarantee them to withstand an internal hydraulic pressure exceeding 200 lbs. per sq. in., and only such

pressure when the tubes were new, admitting that the brazing deteriorated in time. The specifications called for a hydraulic proving test of at least 300 lbs. pressure per sq. in. It was further ascertained that hard brass sheets cannot be used, as the sheets must be soft to permit good brazing, and the tubes can be made hard only by subsequent "drawing" cold.

The substitution of "seamless" brass tubes, solid drawn, was strongly recommended to the agents, because they have no structural line of weakness, like the brazed tubes and can be finished equally hard or harder, as is shown by tests which have been made, a report of which is appended. The order for tubes was therefore placed with the American Tube Works, of Boston, Mass. They have hitherto made a soft and medium grade of brass tubes, the soft being those furnished for locomotives previously ordered. They had hesitated to furnish a still harder grade from fear that tubes would not meet the requirements of the following specifications, which are those of the Baldwin Locomotive Works, and which are embodied in the general specifications of the Antofagasta Railroad.

*Specification for Copper and Brass Boiler Tubes.*

Tubes of brass or copper to be of uniform circumferential thickness and solid drawn; to be perfectly round, and to resist an internal hydraulic pressure of 300 lbs. per sq. in. From the tubes under test, a piece 4 in. long will be cut, annealed, sawn lengthwise, and doubled inside out without showing sign of cracks.

When annealed they must withstand flanging cold a flange ⅝ in. broad for 2 in. tubes without cracking. Copper tubes must withstand flanging hot as well as cold. Tubes other sizes than 2 in. diameter must flange to a width proportional to their diameter.

A piece 30 in. long, annealed and filled with rosin, must withstand being doubled until the extremities touch each other without showing defects.

A piece 30 in. long, not annealed, filled with rosin, and placed on supports 20 in. apart, must withstand bending to a deflection of 3 in. without showing defects.

By the time the matter had been fully discussed the tubes for the three mogul and three consolidation locomotives had already been ordered and made of the medium quality of brass; however, it was decided to try a harder quality of brass for the order of extra tubes. The fears of the American Tube Works proved to be groundless. The specimens withstood all tests and one tube chosen at random easily withstood an internal hydraulic pressure of 1,000 lbs. per square inch. An unannealed specimen deflected to 4 in. without flaw, and an annealed specimen was successfully flanged to ⅝ of an inch.

For further information it was decided to make a series of tensile tests for ultimate strength, elastic limit, elongation and reduction of area, of specimens from brazed tubes unannealed, and from the hard, medium and soft grades of seamless brass tubes, both annealed and unannealed. Further tests were also made of the seamless brass and copper tubes unannealed, and the modulus of elasticity noted together with the other results. There were also made on the harder quality of brass tubes and on the copper tubes, a series of forging and practical tests before and after annealing, and at different temperatures, the more interesting of which are described below.

Referring to the table showing the results of tension tests which are grouped together for the sake of better comparison, it will be noted that the soft seamless tubes exceed the brazed tubes in elastic limit and ultimate strength ten, the medium twelve, and the hard twenty, per cent. The harder grades of seamless tubes also show the same proportionate increase of ductility as does the soft. From the tests in which the modulus of elasticity was taken it is evident that within the elastic limit the deflections of seamless tubes are practically the same. These tension tests indicate that the seamless tubes will support strains greater than those which brazed tubes would support, as the elastic limits are greater, and that, as the quality of brass has been made harder, there has been a corresponding gain in the serviceable qualities of the tubes tending to prevent sagging.

In addition to the customary tests to fulfill the specifications, the hard brass tubes and the copper tubes, both annealed and unannealed, were submitted to excessive bending, expanding, flanging and forging tests, and it was conclusively shown that the copper tubes can be worked cold, after annealing and at any temperature under "cherry red," practically to any extent, and that the brass tubes, after annealing, can be worked cold within all requirements of locomotive practice, and, if heated to a dull red, can be worked as well as copper, but if either is worked unannealed satisfactory results are not assured; if overheated the material is injured, and if work is put on brass tubes at a black heat they will at once be destroyed. Both brass and copper tubes have been properly annealed at the ends and may be swaged and expanded, flanged and beaded in boilers without difficulty.

There was also made a rough test of the probability of tubes sagging, which consisted of placing a tube, condemned for small sand holes but otherwise perfect, on supports 12 ft. apart and loading it with weights hung from the center. For 14 hours it sustained a load of 100 lbs. and deflected 1 1/16 in., but when the load was removed showed no appreciable set. It was then loaded with 200 lbs., and at the end of an hour showed a deflection of 2⅜ in. and a set of 1/16 in. Attention may also be called to the fact that at the hydraulic testing machine the hard brass tubes showed greater rigidity and stiffness than the medium grade and the copper tubes.

In view of the above it is believed that the medium and hard grades of seamless brass tubes in these orders will be found to give better results than previous tubes from the same makers and to be much superior to brazed tubes. Should trouble be experienced, however, it is thought that the remedy is to be sought in the use of lap-welded iron or seamless steel tubes, or in shortening the boilers of locomotives.

It may be of further interest to note that when the medium tubes were placed in position in the locomotives at the Baldwin Locomotive Works the workmen first attempted to expand, flange and bead them hot, with the result that the tubes cooled to near a black heat, and a number were condemned for cracks at the beading. When required to work them cold entirely satisfactory results were secured.

*Record of Tension Tests.—Boiler Tubes for the Antofagasta R. R.*

NOTE.—These tests were first attempted on the Emery Testing Machine at Columbia College, but, owing to the slipping of the grips, the elastic limit could not be accurately determined. The remainder of the tests were therefore made at the works of Tinnis Olsen & Co., Philadelphia Pa. Test M A 3 was stretched beyond the elastic limit at Columbia College, and subsequently broken at Olsen & Co's.

| Mark. | Loads in lbs. per square inch. Elas. limit. | Loads in lbs. per square inch. Maximum. | Elongation per cent. in 2 in. | Reduction of area per c't. | Modulus of elasticity. | Where tested. |
|---|---|---|---|---|---|---|
| 2-in. brazed tubes, unannealed. | | | | | | |
| B1 | 54,170 | 58,360 | 24.5 | 47.2 | ..... | Olsen's. |
| B2 | 52,040 | 57,410 | 25.0 | 43.4 | ..... | " |
| B3 | 52,050 | 56,890 | 28.0 | 48.8 | ..... | " |
| B4 | 52,380 | 57,200 | 22.0 | 38.8 | ..... | " |
| 2-in. solid drawn tubes, soft quality, unannealed. | | | | | | |
| S1 | ..... | 65,120 | 14.0 | 32.6 | ..... | Col. College. |
| S2 | ..... | 65,820 | 20.0 | 46.1 | ..... | " |
| S3 | 62,810 | 66,630 | 22.5 | 55.1 | ..... | Olsen's. |
| S4 | 63,540 | 67,230 | 20.5 | 42.2 | ..... | " |
| Same, annealed. | | | | | | |
| SA1 | 20,360 | 48,980 | 50.0 | 41.8 | ..... | Col. College. |
| SA2 | 19,970 | 48,390 | 54.0 | 42.6 | ..... | " |
| SA3 | 19,870 | 48,050 | 46.0 | 36.1 | ..... | " |
| SA4 | 18,110 | 49,840 | 52.0 | 50.4 | ..... | Olsen's. |
| 2-in. solid drawn tubes, medium quality, unannealed. | | | | | | |
| M1 | 59,810 | 71,080 | 22.0 | 41.3 | ..... | Olsen's. |
| M2 | 60,530 | 71,630 | 19 0 | 29.9 | ..... | " |
| M3 | ..... | 69,980 | 19.0 | 26.8 | ..... | Col. College. |
| M4 | 65,180 | 69,400 | 16.0 | 36.6 | ..... | Olsen's. |
| M5 | 59,830 | 73,330 | 10.0 | 32.7 | 12,237,000 | " |
| M6 | 54,770 | 75,430 | 9.5 | 36.2 | 15,504,000 | " |
| M7 | 64,210 | 76,080 | 10.5 | 33.9 | 15,756,009 | " |
| M8 | 56,090 | 73,720 | 11.5 | 28.0 | 13,536,000 | " |
| Same, annealed. | | | | | | |
| MA1 | 15,170 | 53,730 | 46.0 | 43.7 | ..... | Olsen's. |
| MA2 | ..... | 52,260 | 36.0 | 35.3 | ..... | Col. College. |
| MA3 | 46,300 | 50,500 | 31.0 | 44 8 | ..... | See n'te abv. |
| MA4 | 17,610 | 54,790 | 48.5 | 43.0 | ..... | Olsen's. |
| 2-in. solid drawn tubes, hard quality, unannealed. | | | | | | |
| H1 | 67,450 | 81,860 | 9.5 | 28.4 | 14,260,000 | Olsen's. |
| H2 | 64,090 | 79,730 | 8.5 | 25 9 | 13,702,000 | " |
| H3 | 64,520 | 82,920 | 10.2 | 32.4 | 13,882,000 | " |
| H4 | 61,350 | 82,390 | 11.5 | 29.3 | 12,984,000 | " |
| 2-in. solid drawn copper tubes, unannealed. | | | | | | |
| C1 | 38,120 | 45,080 | 12.0 | 69.4 | 12,030,000 | Olsen's. |
| C2 | 39,580 | 44,850 | 11.5 | 71.4 | 15,023,000 | " |
| C3 | 39,460 | 44,490 | 14.0 | 73.2 | 15,723,000 | " |
| C4 | 37,280 | 46,070 | 12 0 | 75.2 | 15,001,000 | " |

## TECHNICAL.

### Manufacturing and Business.

The West Virginia Bridge Co., of Point Pleasant, has been incorporated in West Virginia.

A quarterly dividend of 1½ per cent. has been declared on Union Switch & Signal Co.'s preferred stock.

The Gold Car Heating Company has paid 10 per cent. in dividends to its stockholders during the past year and reports a handsome surplus after the payment of these dividends.

The Champion Safety Appliance Co., of Chicago, with a capital stock of $100,000, has been incorporated in Illinois by M. C. Fullenlove, John C. Cosgrove and Joseph A. Sleeper.

The Worthington Car Coupler Co., of Chicago, has been incorporated in Illinois. The capital is $100,000. The incorporators are: A. J. Worthington, Lewis W. Dickerson and Arthur H. Simmes.

The Michigan Railway Supply Company has recently added the manufacture of cold punched nuts and steel washers to its other departments and has issued a neat pamphlet giving the various standard and extra sizes.

David Hitchcock has been elected President of the National Tube Company, vice E. W. Converse, deceased, and E. W. Converse, Jr., has been elected a Director. E. C. Converse, General Manager, will assume the duties of Vice-President.

Mr. Benjamin Watson, for many years associated with Mr. George A. Evans, of 18 Wall street, New York City, has withdrawn from that connection and opened an office under his own name at 33 Wall street, New York, dealing in steel rails, cars and other railroad supplies.

During the month of December, 1893, Messrs. Charles F. King & Co., contractors, drove 323 ft. of tunnel, 7 ft. × 11 ft., in the Jeddo Tunnel at Ebervale, Luzerne County, Pa., with two 3½ in. "Ingersoll-Sergeant" rock drills. This work was done in 27 days by two shifts of men, each shift working 10 hours a day.

The Toledo Car Wheel Co. elected the following directors at a meeting held in Toledo on Jan. 8: Charles D. Milmine, W. W. Bolles, Albert A. Milmine, L. S. Baumgardner and H. B. Milmine. The officers elected were: President, Charles D. Milmine; Vice-President, Albert A. Milmine; Secretary and Treasurer, H. B. Milmine.

A charter was issued last week to the West Virginia Bridge Company, in West Virginia, to build and operate a bridge works and structural iron and steel works at Point Pleasant, W. Va. The capital stock paid in is $50,000, and the incorporators are all local men, although it is understood that New York capital is to build the plant.

The creditors of the San Francisco Bridge Company have selected Mr. Thomas Carter, a member of the firm of Carter Brothers, car builders of Oakland, Cal., as assignee of the bridge company. President McMullen announces that the liabilities amount to $238,000, but he has not yet been able to make a close estimate of the assets. He declares that the company is solvent and is confident that its present embarrassment will be of short duration.

The United States Headlight Company has been incorporated in New York state by Charles L. Williams, of Utica, N. Y., and others. The capital stock is $1,500,000, and the chief office is to be at Utica. The following are the directors: Irving A. Williams, Utica; Pomeroy L. Salmon, Syracuse; Frank L. Upton, Rochester; Ward M. Willets, Chicago; Joel Kirby, Jr., Dayton; and Alexander Handlan, St. Louis. The directors at the meeting in New York have elected the following officers: President, Joel Kirby, Jr., Dayton, O.; Vice-President, Ward M. Willets, Chicago; Secretary and Treasurer, Aras J. Williams, Utica. The new company includes six of the largest manufactories of locomotive and street railroad headlights in this country, and it is organized to effect a concentration of business and reduce the cost of manufacture. For the present the different companies forming the consolidated company will continue the operation of their present plants.

### Iron and Steel.

The Bethlehem Iron Company's steel mill shut down last week for lack of orders. The company has only one blast furnace in operation.

The Wheeling Iron & Steel Company has resumed work in a portion of its plant, employing 500 men. The mills have been idle three months.

The plans of the Johnson Company, of Johnstown, Pa., for building a new rail mill have been reported in the daily papers during the past week. T. L. Johnson, Vice-President of the company, announced in a debate on the tariff in Congress that the Johnson company had determined to build a new rail mill and make other improvements amounting to $3,000,000. President A. J. Moxham confirmed this statement later and stated that the stockholders at the annual meeting would be asked to authorize the issue of $2,000,000 of new bonds for improvements. The site for the new mill has not yet been decided upon it, and it may not be built in Johnstown.

### New Stations and Shops.

The Berlin Iron Bridge Co., of East Berlin, Conn., is putting the roof on a building for the United States Government, at Fort Wadsworth, N. Y. The building is 41 ft. × 231 ft., the roof being made entirely of iron—iron trusses covered with corrugated iron. The new works of the Stanley Electric Mfg. Co., at Pittsfield, Mass., will be entirely of iron, designed and built by the Berlin Iron Bridge Co.

### Bremen Electric Railroad.

In the city of Bremen, Germany, an electric street railroad over four miles long, 1½ miles of it double track, has been built on the Thomson-Houston system by the electrical engineer Van Deopole, for the Union Elecrical Company, of Berlin. The conductor wires in the built-up streets, where practicable, are carried by supports attached directly to the houses, in the form of ornamental rosettes. The highest speed permitted is 7¼ miles an hour in the city and 10 miles outside.

### Stanserhorn Mountain Railroad.

The last of the Swiss mountain railroads is that up the Stanserhorn, which rises 6,235 ft. above sea level, a little south of Lake Lucerne, not very far from the Pilatus and the two Rigi railroads. It is a cable road, or rather three cable roads, each with two cars, a motor at the upper end and an automatic turnout in the middle. The passengers change cars at the end of each line. It can carry 32 persons every 16 or 17 minutes, and, including the changes of passengers, the time required to reach the summit is 54 minutes. The fare for the round trip is 8 francs ($1.55). The first section is 1,585 meters long and rises 276.7; the second section, 1,082 meters long, rises 508.4; and the third, 1,270 meters long, rises 627.8 meters. The grades of the first section vary from 422 to 1,452 ft. per mile; of the second and third, from 2,112 to 3,273 ft. per mile. The braking is effected from the motor stations, and is novel, peculiarly formed rails being required for it. The motive power is electricity, generated at each motor station by water power, but a

steam engine is provided as a reserve. The whole road cost about $300,000. It was opened Aug. 23 last. The builders of the road and inventors of the brake are Buder & Durrer, of Kägiswyl, Obwalden.

**Purdue University.**

The new engineering laboratory of this university is to be dedicated this evening (Jan. 19). Addresses will be made by the Governor of Illinois, the director of the Chicago Manual Training School, Professor Goss and others.

**Marine Notes.**

*Olympia.*—The premium speed of the Olympia, when corrected for the effect of tide and wind, is reported by the trial board as 21.686 knots per hour, or .064 hundredths of a knot less than 1¾ knots in excess of her contract speed. This gives the contractors a premium of $300,000. In every point of machinery, speed, horse power and coal consumption the requirements of the contract and specifications have been excelled. The contractors, the Union Iron Works, depend upon this premium for their profits. It is reported that the cruiser had cost them $1,797,300 when she left the works for her first trial trip, and the contract price was $1,796,000. She had yet $100,000 worth of work to be done on her. The breakage of machinery on that preliminary trip is said to have cost $50,000. So that the profits of the contractors will amount to what there is left when the cost is deducted, or $148,700.

*Columbia.*—The cruiser Columbia has been accepted by the Secretary of the Navy subject to the final trial of forty-eight hours at sea, which is to take place within four months from date of acceptance.

*New York.*—The cruiser New York, now on her way to Rio de Janeiro, has been finally accepted by the Secretary of War, and treasury warrants issued for the full amount due to her contractors.

*Marblehead.*—The trip of the Marblehead having been reported successful by the trial board, she was recently accepted preliminary to her four-months trial service. The premium paid was $125,000, the petition for a new speed trial not having been granted.

*Montgomery.*—The trial of the Montgomery will take place in Long Island Sound on Jan. 15.

*Pacific Log Raft.*—Not content with the experience of their Eastern friends, the Pacific Coast people have had to repeat the experiment of the Leary log raft. A large cigar-shaped raft was made up at Coose Bay, Oregon, to be towed to San Francisco and there sawed up into lumber. The raft was valued at about $25,000, and was being towed by several large tugs when overtaken by a storm about 200 miles north of San Francisco. The raft went to pieces, and only about one-third of it was saved by beaching it intact. The loss falls upon the San Francisco Bridge Company, which caused it to pass into the hands of a Receiver. The estimated loss to the company is $35,000.

*Campania and Lucania.*—The Lucania and the Campania have been laid up, partly for the alterations before noted by us and partly, perhaps, for the reason that it is too expensive to continue them in service at this time of year. They are the limited trains of marine travel to be used when many people are making the trans-Atlantic voyage. This is not a new thing with the Cunard people, for they have often laid up their largest steamers in midwinter. The Campania will leave for New York Feb. 24 and the Lucania March 10, 1894.

**Riehle Testing Machine at Cornell.**

There is now being erected at the College of Civil Engineering at Cornell University the largest Riehlé screw testing machine yet made. It is designed to test for direct tension and compression and transverse strains. Its extreme dimensions are: Height, 20 ft., width, 5 ft., and length 15½ ft., and it weighs about 33,000 lbs. It will admit bars for tension and columns for compression of any length up to 12 ft. The capacity of the machine is 400,000 lbs. for tension and compression, and 100,000 lbs. for transverse strain. The beam has the Riehlé patent vernier traveling poise, which is adjusted to standard weight and rises automatically. The machine will be used for purposes of special investigation in the engineering laboratory.

**Another Air-Brake Injunction.**

On Tuesday, Jan. 16, a motion was argued before Judge Coxe, of the United States Circuit Court for the Northern District of New York, for an injunction against the Eames Vacuum Brake Company, restraining that company from the manufacture of air-brake apparatus, infringing the broad claims of the Westinghouse patents, the validity of which was established in the recent suit against the New York Air-Brake Company. This motion was granted by Judge Coxe and an order for an injunction similar to that entered against the New York Air-Brake Company has been entered against the Eames company.

**The Kinsman Block System.**

The Kinsman Block System Company, of 96 Broadway, New York City, is completing an installation of about 8 miles of double track for the Chicago, Milwaukee & St. Paul. Some of the apparatus of the Kinsman company has been in experimental use on that railroad for several months, and we understand that the installation now being put in is for regular service. The Kinsman company is also equipping about three miles of track on the New York, Susquehanna & Western, near Weehawken, for experimental purposes and for exhibition.

**Block Signaling on the Reading.**

We were in error last week in saying that the Reading will put in the electro-pneumatic block signaling. The facts are that this road has asked for propositions from prominent signal companies to thoroughly protect about 30 miles in the vicinity of Philadelphia. The precise form of system to be adopted is dependent on the propositions received.

**The Launch of a Northern Line Passenger Steamer.**

The first of the two Northern Line passenger steamers was successfully launched, lake fashion, at the Globe Iron Works, Cleveland, on Saturday the 6th inst. These boats, which are intended to make an average speed of 20 statute miles an hour between Duluth and Buffalo with a governing depth of 16 ft. of water, are of more interest to the people of this country than the larger and faster boats now building by the Cramps for trans-Atlantic service. The "North West," the boat launched, is of mild steel throughout. She is 383 ft. over all, 360 ft. between perpendiculars, 44 ft. broad and 26 ft. molded depth. She has four bladed twin screws 13 ft. diameter and 18 ft. pitch, with quadruple expansion engines; cylinders 25, 36, 51½ and 74 in. × 42-in. stroke. Steam is furnished by 28 Belleville water-tube boilers. They are expected to furnish 7,000 H. P. to the main engines and 500 H. P. to auxiliary engines under natural draft. The side launch involved moving the vessel, which weighed about 2,100 tons, 60 ft. horizontally and then dropping it between 4 and 5 ft. through the air to reach a calculated draft of 8 ft. aft and 6 ft. forward. This was accomplished with perfect success. As these boats are for through passenger traffic on the lakes, and if successful will be followed by other boats in the same line until there are enough to run a daily line between Duluth and Buffalo, there were a large number of men prominent in lake business and transportation present, besides represenentatives from every shipbuilding yard on the lakes of any importance. Before the completion of the Lake Shore Railroad some of the fastest and finest boats in the world were running on Lake Erie. These boats, it is thought, will hold the same position.

## THE SCRAP HEAP.

**Notes.**

An officer of the Lehigh Valley states that, up to Dec. 25th, 236 striking locomotive engineers had been taken back by the road, leaving 291 still out.

A number of freight conductors and brakemen of the Nashville, Chattanooga & St. Louis struck on the night of Jan. 12, because a man had been suspended, but returned to work in about six hours.

The car repair shops of the New York, Lake Erie & Western, at Jersey City, were burned on the night of Jan. 12. The loss was about $40,000. The buildings were old and mostly frame structures.

A resolution has been introduced in the Massachusetts Legislature to investigate the alleged action of the New York, New Haven & Hartford in unlawfully discriminating against the New York & New England.

The Collector of Customs at Detroit has been authorized to admit free of duty the running gear of certain cars which were damaged by collision in Canada and came back to Detroit for repairs.

Numerous suits for damages have been filed at Louisville against the Phœnix Bridge Company in consequence of the injuries resulting from the fall of the falseworks of the bridge there on Dec. 15. The total amount of damages claimed thus far is $245,000.

A passenger train of the Hannibal & St. Joseph was stopped by five masked men near St. Joseph, Mo., on the evening of Jan. 10 and the express car was robbed. It is said that the messenger concealed a package of $10,000 just before the robbers entered, and thus saved it.

Employees' passes now in use on the Lake Shore & Michigan Southern are made out for a certain number of rides instead of for a certain length of time. In one sample which a reporter saw, 75 rides were provided for, a figure being punched out for each ride. The Missouri Pacific has stopped a large amount of free riding by employees between St. Louis and Kirkwood and St. Louis and Carondelet by instructing conductors to collect fares for these trips.

The Baltimore & Ohio Southwestern shops at Washington, Ind., are now running six hours a day. The men were given their choice to accept this reduction or to have work entirely stopped for a while. The employees of the Ohio River Railroad when notified recently of a 10 per cent. reduction in pay, called Mr. Arthur and other brotherhood chiefs to remonstrate with the road; and it appears that they succeeded in getting a promise that the wages should be restored as soon as the business depression should be relieved.

The Pennsylvania Railroad Company has recently put in the hands of each of the 40 physicians now employed as "medical examiners" in connection with the Employees' Relief Department, a handbag thoroughly furnished with such instruments and appliances as a medical man may need when called on to relieve suffering. These "emergency satchels," as they are called, are intended to be carried on the trains by those having them in charge when traveling, so that they can at once respond to any sudden call for professional aid to passengers or employees.

A press dispatch of Jan. 14 reports heavy rain storms flooding every river between the Cascade mountains and Pacific ocean, from British Columbia to the California line. On the night of the 12th four bridges were washed away on the South Bend branch of the Northern Pacific, and a thousand feet of track was washed out. Several washouts occurred on the Gray's Harbor branch near Chehalis. A repair train ran into a washout, and was thrown down an embankment, the engineman being killed. The Great Northern & Union Pacific have both had snow slides and washouts on the West Cascade mountains. On the North Pacific Coast Railroad, near Cazadero, Cal., an engine was crossing Austin Creek on the night of Jan. 14, when the bridge gave way and the engine fell into the stream below, a distance of 40 ft., drowning seven men. The men were on their way to a washout.

Five men were drowned by the fall of a temporary footbridge over Newtown Creek at Meeker avenue Brooklyn, N. Y., on the evening of Jan. 12, and four others are missing. Over 50 men and boys were thrown into the water, which was 9 ft. deep. The bridge was built, for the use of foot passengers alone, while a new iron drawbridge was being put in, and had been in use about 15 months. It was about 200 ft. long, and had two draws, each side of the center abutment of the permanent bridge. The draws were each 35 ft. long. They worked on a swivel at the shore ends, and were operated by pulleys and ropes. The men had crowded on the fixed portion of the bridge and on the draw which was closed, while the other draw was open for a vessel, and it was the closed draw which gave away under its load.

A bill has been introduced in the Legislature of Maryland for the regulation of railroads and the establishment of a railroad commission; also another bill to extend the time during which railroads shall not be required to heat their passenger cars by steam from the locomotive. This subject was first introduced five years ago, and the time has already been twice extended. In the New York Legislature a bill has been introduced reducing the fare on the Long Island Railroad to two cents a mile, and to compel the Suburban and Manhattan elevated roads in New York City to carry passengers through over the lines of both companies for a single fare of five cents. A bill has been introduced in the Ohio Legislature making railroads responsible to their employees for injuries occurring through the negligence of a fellow-employee.

**South American Notes.**

The Amazon Steam Navigation Co. has declared a dividend on account of the current year of 3 per cent.

The Argentine government has accepted the invitation of Chili to participate in the Mining and Metallurgical Exhibition which will be opened in Santiago on Sept. 1, 1894.

The South Western of Venezuela (Barquisimeto) Railway, which was totally destroyed in many places by floods in 1892, has been repaired, and traffic has been resumed throughout the length of the line.

The total capital value of the Chilian State railroads on Oct. 31, according to an official report, was $60,289,000. The debit against this has been reduced by earnings and reimbursements to a little over $19.000,000.

A new corporation has been formed to acquire the Guanta Railroad and coal property in Venezuela. The subscribed capital amounts to $250,000, and it is reported that work has already been commenced in the coal mines.

The Uruguay Northern Railroad Co. announces substantial gains in the year ending June 30, 1893, over the previous year, the receipts for the two years respectively being as follows: From passenger traffic, $11,500 and $9,500, and from freight traffic $18,500 and $13,000. The company has declared a dividend of 1 per cent. on the preferred shares.

The total length of railroads in operation in Argentine aggregates 8,111 miles, distributed as follows:

| | Miles. | Cost per mile. |
|---|---|---|
| Belonging to the nation | 676 | $65,600 |
| Guaranteed by the nation | 2,339 | 46,600 |
| " provinces | 744 | 32,500 |
| Property of unguaranteed companies | 4,352 | 58,300 |

The Cordoba & Rosario Railway (Argentine) reports that its earnings during the first half of 1893 were $230,000, as against $69,000 for the first half of 1892. The total freight movement was 200,000 tons, of which 176,000 tons was local and 24,000 tons through traffic. The tonnage shows an increase of 44 per cent., which has been carried with an increase of only 8½ per cent. of the train-mileage. The working expenses have consumed 68 per cent. of the gross receipts, whereas in 1892 the working expenses amounted to 85 per cent.

According to an official statement of the Buenos Ayres & Valparaiso Trans-Andine Railway Co., 75½ miles of its line is complete, and has been accepted by the Argentine government. Another section of 13½ miles, extending as far as Punta de las Vacas, is so nearly finished that the government has granted permission to run trains to that point, Thus 89 miles out of a total of 110 is open to traffic. Of the remaining 21 miles, the next 17 up to Las Cuevas offers no particular difficulty, while the last four miles includes 2⅝ miles of tunnel, the longest being the Summit Tunnel of 1¼ miles. Of this tunnel 1,788 meters of heading and 190 metres of full section have been bored. The gap between Las Cuevas and Salto del Soldado, the present terminus of the Chilian section, is 43 miles. Within a few months stage coaches will cover all but 12 miles of this distance. The through fare from Buenos Ayres to Valparaiso is $60, and tickets via this route are now sold from London to Valparaiso for $200. The traffic receipts from the Argentine section alone during four months ending June 30, 1893, were $28,500. The company has obtained permission from the government to discontinue construction until the Chilian section has approached nearer the frontier, and then to progress at such a rate as to finish simultaneously with that end of the line.

**"The General."**

The old Western & Atlantic locomotive, "The General," recently on exhibition at the World's Fair and one of the most interesting relics of the civil war, has finally been landed at the Libby Prison War Museum in Chicago, where it will doubtless remain permanently.

**Russian Railroad Training Schools.**

There exist in Russia 28 schools for the training of young men for railroad service. Twenty-five of these schools are maintained by the state, the expense being met by a small mileage tax on the independent railroads, and by trifling annual dues from all alumni. The total cost of maintaining the 25 schools is less than $200,000 *per annum*. The curriculum, which is designed for a three-years course, includes elementary mathematics, bookkeeping, physics, applied mechanics, telegraphy, working in wood and metals, foundry practice, forgework, joining, gymnastics, etc. After this follow two years of actual practice in construction and maintenance of way and in the operation of signals and running of trains. The number of alumni from these schools exceeds 1,500.

**The Bordeaux-Narbonne Ship Canal.**

M. René Kerviller has made a report on this projected canal which is to connect the Atlantic and the Mediterranean, taking the place of the old Canal-du-Languedoc, or Du Midi, which was built 1668-81 at the sole expense of Paul Riquet de Beziers and given to the French nation; this has a depth of only 6¼ ft. The ship canal is to be 320 miles long from sea to sea, 144 to 215 ft. broad, with a minimum depth of 28 ft., so as to pass the largest ironclads. The present summit, at Castelnandry, is 425 ft. above Narbonne. It is proposed to have 22 locks, 650 × 80 ft., put in place, with lifts varying from 20 to 60 ft. Ships are to be towed or drawn by the aid of fixed engines. M. Kerviller estimates the cost of a single-track canal, with sidings three quarters of a mile long every eight miles, at $135,000,000, to which should be added $15,000,000 for dormant capital while the canal is under construction, or $150,000,000 in all. The estimated net income on this is at the rate of five per cent. In addition to the commercial value of the canal it will, as a strategetic work, greatly lessen the value of Gibraltar as against the French and their allies.

**The Antwerp International Fair.**

We have already announced that an international fair will be held in Antwerp from May 5 to Nov. 12, 1894. The interests of this fair in the United States are being arranged for by what appears to be called the Commission of the United States to the Antwerp International Exposition or the American Propaganda for the Antwerp Exposition. We cannot make out from the printed matter sent to us which name the body prefers. The Commission contains enough names of weight to guarantee its responsibility. The President is Hon. Thos. B. Bryan, who was Commissioner General of the Columbian Exposition, and among the names of the Commissioners we find those of Senator Palmer, who was President of the Columbian Commission; John T. Dickinson, who was Secretary, Major Pangborn and Solomon Thatcher, Jr., of the American Exhibitors' Association, and many other well-known names. The address of the Commission is 741 Monadnock Building, Chicago, and the Secretary is James P. Holland, from whom those who have an idea of exhibiting can get all the information desired. It is announced that the Pennsylvania Railroad will make an exhibit at this fair.

**Just What Railroads Are.**

Governor O'Ferrall, of Virginia, in his inaugural address, scattered a wealth of rhetorical flowers, such as are apt to get nipped in the shrewd air of the North, and, among the rest, touched upon railroads in a glorious outburst, from which we extract the following for those of our readers who have to spend their lives in more prosaic climes. After expressing the belief that the interests of both the roads and the people require that there be no oppression or discrimination on the part of the one and no unreasonable demands on the part of the other, the Governor says:

Railroads I recognize as the great explorers and mighty developers of a country's resources. They lead in the march of progress, tunneling mountains, bridging gulches, spanning streams, penetrating new and uninhabited regions, changing the wilderness into smiling farms and even the barren plain into verdant fields, building homes and giving employment to almost countless thousands. In their track plenty abounds where want stalked abroad; the plough share turns up the virgin soil so long trodden by the native buffalo; the voices of the artisan and mechanic are heard where that of the wild beast so long sounded defiance to the disturber of his lair or den; the smoke of civilization ascends to the clouds and meets the morning sun in his rising glory and bedims the moon in her silver flight, where from the time the stars sang together, at the birth of creation, they shone by day and by night unobscured by even the exhalation from a burning bush.

**A New Explosive.**

Fulgurite is the name given to the new explosive brought out a short time ago in France by Raoul Pictet, of ice machine fame. Its composition has thus far been kept secret, though it is stated to embrace none of the elements of dynamite or of melinite. At the same time it is claimed to be superior in its effects, both as an industrial and as a military agent, to any of the explosives now known and in use, and to entail none of their dangers of manufacture.

**Sixteen Killed by a Train Accident in Cuba.**

A dispatch from Havana reports a bad accident on the Timina-Matanzas Railroad, eight miles from Cumanayagua, in the Province of Matanzas, on Jan. 15. A passenger train ran over a cow, and the engine was thrown from the rails and several of the cars piled upon each other. Sixteen persons were taken out of the wreck dead, and nine others were badly injured.

**Decline of Canada's Marine.**

Returns of the shipping of the Canadian Dominion show a lamentable decrease both in vessels and tonnage during recent years. In each province the shipbuilding industry is declining. During the last ten years the total tonnage has decreased about one-third of the total, or by 320,895 tons from 890,810 tons in 1884 to 569,915 in 1893. In the first named year Nova Scotia had 8,019 vessels, of a total tonnage of 543,835, while she now has only 2,717, with a tonnage of 394.861; New Brunswick owned 1,096 vessels, with a tonnage of 307,762 now she has 1,011 vessels, with a tonnage of but 156,645. Prince Edward Island possessed 234 vessels, with a tonnage of 39,213, now she has 188, with a tonnage of 19,409.

## LOCOMOTIVE BUILDING.

The Atlantic Coast Line locomotive order referred to last week is to be for four mogul engines for freight service on the Richmond Division instead of passenger engines, as reported. The contract has not yet been awarded.

## CAR BUILDING.

The Jacob Dold Packing Co., of Kansas City, is in the market for 50 refrigerator cars.

The Cold Blast Refrigerator Co., of Kansas City, is asking bids for about 200 refrigerator cars.

The Wells & French Car Co., of Chicago, has an order for 200 refrigerator cars for the Armour Packing Co.

The Cleveland, Chicago, Cincinnati & St. Louis road is in the market for 100 stock and 100 r frigerator cars.

The Wickes Refrigerator & Car Co. is having 250 refrigerator cars built by the Missouri Car & Foundry Co.

The South Baltimore Car Works have orders on hand for over 500 cars, and the shops are now running on full time.

The Milton Car Works, of Murray, Dougal & Co., at Milton, Pa., have closed down, having completed all orders on hand.

The Produce Dealers' Dispatch line, with offices in the Royal Insurance building, Chicago, is in the market for 50 refrigerator cars.

The Wagner Palace Car Company is now employing at its East Buffalo shops nearly 1,000 men on repair work. The principal work now being done is putting on vestibules to all cars not fitted with them. Improvements costing about $50,000 have been made to the East Buffalo plant in the last few months. A new office has been put up, an iron shed 50 ft. × 150 ft., and a storage shed 800 ft. long, covering four tracks, built.

The removal of the car department of the Litchfield Car & Machine Company from Litchfield, Ill., to Memphis, Tenn., is fully determined upon, and will become an actual fact within a short time. The officers of the Litchfield company deny that there is any truth in the newspaper reports that the removal will not be made. The Memphis Car & Foundry Company, whose incorporation was reported last week, is to be the name under which the works will be operated. Officers for that company were to be elected at a meeting on Jan. 15. The site for the new works at Birmington, a suburb of Memphis, is now being graded, and the erection of the buildings will be commenced as soon as sufficient material can be accumulated. It is expected that the new plant, which will be modern and complete in every particular, will be in operation by May. The shops will have a capacity of not less than 20 cars a day. The entire capital stock of the new company has been subscribed for.

## BRIDGE BUILDING.

**Albany, N. Y.**—The following awards have been made by the Superintendent of Public Works of New York State: For building a lift bridge over the canal at Bridge street, Amsterdam, to Kellogg Iron Works, of Buffalo, at $2,362; building superstructure of a lift bridge over canal at Syracuse to Wrought Iron Bridge Co., of Canton, O., for $7,000; building a lift bridge at Ann street, Little Falls, to Kellogg Iron Works, of Buffalo, at $2,752; building a bridge over the canal at Ford street, in Rochester, to the same company, for $2,845.

**Allentown, Pa.**—The new inter-county bridge spanning the Lehigh River and connecting Upper Catasauqua with Hokendaugua is now completed, at a cost of $55,000. A large part of the cost is borne by the Rapid Transit Co. (which will run cars over it), the Lehigh Valley and Lehigh & Susquehanna roads, which pay for the spans over their tracks, and the Thomas Iron Co. The structure is entirely of steel, is 1,050 ft. long and 30 ft. wide.

**Baltimore, Md.**—McCabe Bros., the contractors for the new North Avenue bridge, have completed the west abutment and two piers, but the structure will not be ready for use before next December. It has been decided to build a stone arch instead of an abutment at the east end of the bridge, thus lessening the cost fully $20,000. Falsework is being placed in position.

Work will be commenced on the new iron bridge over Jones Falls at Maryland avenue in a short time. The Pennsylvania Steel Co. has the contract.

The new overhead steel viaduct of the City and Suburban Railroad Co. from Huntingdon avenue at William's street to the intersection of Cedar and First avenues, will be ready for use probably next week. It is 2,000 ft. long.

**Boone, Ia.**—The Chicago & Northwestern will build a new bridge across the Des Moines River at Moingona, Ia., at a cost of about $50,000.

**Charleston, W. Va.**—The Town Council has awarded the contract for the new bridge extending from Charles street north over the Baltimore & Ohio Railroad to the Vulcan Road Machine & Bridge Co., of Charleston, W. Va.

**Fairmont, W. Va.**—Plans for building a bridge from West Fairmont, W. Va., across Black's Run to the South Side, are under discussion. The money is to be raised by popular subscription. There are natural foundations, and the structure would be a regular highway bridge about 200 ft. in length, probably one span.

**Knoxville, Tenn.**—The project for building a new steel highway bridge over the Tennessee River at Knoxville is under consideration by the county court, which is now in session.

**London, Ont.**—Sealed tenders will be received at the County Clerk's Office, London, until Jan. 24, for erecting an iron superstructure of a bridge over Doty's Creek, between the township of North Dorchester and West Missouri, Middlesex.

**Miamitown, O.**—The Hamilton County Commissioners have awarded the contract for the superstructure of the bridge across the Miami River at Miamitown to the King Bridge Co. of Cleveland, O., at its bid of $41,400, on recommendation of the County Engineer.

**Milford, O.**—The County Commissioners of Hamilton and Clermont counties have awarded the contract for the bridge over the Little Miami River at Milford, to the Brackett Bridge Company, at its bid of $25,000.

**Minneapolis, Minn.**—The matter of providing for crossings at some 30 streets of the tracks of the Hastings & Dakota division of the Chicago, Milwaukee & St. Paul is still unsettled. Several plans have been presented by City Engineer Copperlau and Engineer Onward Bates, of the company, but so far the officials of the company and the city have been unable to reach a settlement as to the one to be followed. The two principal projects provide, one for overhead bridges and the other for elevated tracks.

**New Braunfels, Tex.**—The city will build two iron bridges, one over the Comal River on San Antonio street and one over Comal Creek on Seguin street; the total cost will be about $15,000.

**Ottawa, Ont.**—Tenders are being called by Robert Surtees, City Engineer, for the construction of a bridge over Rideau River at Ponter's Island.

**Pensacola, Fla.**—The County Commissioners of Escambia County are ready to authorize the erection of a new bridge across the Perdido River if the Baldwin County Commissioners will agree to pay part of the expense of the structure.

**St. Clairsville, O.**—The County Commissioners of Belmont County, O., with offices at St. Clairsville, have sold to Faris, Leach & Co., of Chicago, $80,000 of bridge bonds, the money to be expended in the improvement and replacing of bridges in the county.

**West Chester, Pa.**—Viewers have been appointed to determine the question of the erection and site of a county bridge over White Clay Creek in New Garden Gap. They will meet Jan. 25.

## MEETINGS AND ANNOUNCEMENTS.

**Dividends:**

Dividends on the capital stocks of railroad companies have been declared as follows:

*Lake Erie & Western*, quarterly, 1¼ per cent. on the preferred stock, payable Feb. 15.

*Long Island*, quarterly, 1¼ per cent., payable Feb. 1.

*Louisville, New Albany & Chicago*, semi-annual, 1½ per cent. on the preferred stock, payable Feb. 15.

*Mahoning Coal*, semi-annual, 2½ per cent. on the common stock, payable Feb. 1.

*Nashville, Chattanooga & St. Louis*, quarterly, 1¼ per cent., payable Feb. 1.

*St Paul, Minneapolis & Manitoba*, quarterly, 1½ per cent., payable Feb. 1.

*Toledo & Ohio Central*, quarterly, 1¼ per cent. on the preferred stock, payable Jan. 25.

*Wheeling & Lake Erie*, quarterly, 1 per cent. on the preferred stock, payable Feb. 15.

**Stockholders' Meetings.**

Meetings of the stockholders of railroad companies will be held as follows:

*Fort Wayne & Jackson*, annual, Jackson, Mich., Jan. 25.

*Granite*, annual, Boston, Mass., Jan. 22.

*Junction Canal & Railroad Co.*, annual, Elmira, N. Y., Feb. 6.

*Monterey & Mexican Gulf*, special, New York City, Feb. 20.

*New York, Lake Erie & Western*, special, New York City, March 6.

*St. Catharines & Niagara Central*, annual, St. Catharines, Ont., Jan. 22.

*Southwestern*, annual, Macon, Ga., Feb. 8.

**Technical Meetings.**

Meetings and conventions of railroad associations and technical societies will be held as follows:

The *Freight Claim Association* will hold its annual meeting in Louisville, Ky., March 14.

*The Central Railway Club* will meet at the Hotel Iroquois, Buffalo, N. Y., Jan. 24.

The *New England Railroad Club* meets at Wesleyan Hall, Bromfield street, Boston, Mass., on the second Wednesday of each alternate month, commencing January.

The *Western Railway Club* meets in the rooms of the Central Traffic Association, Monadnock Building, Chicago, on the third Tuesday in each month, at 2 p. m.

The *New York Railroad Club* meets at the rooms of the American Society of Mechanical Engineers, 12 West Thirty-first street, New York City, on the third Thursday in each month, at 8 p. m.

The *Northwest Railroad Club* meets at the Ryan Hotel, St. Paul, on the second Tuesday of each month, except June, July and August, at 8 p. m.

The *American Society of Civil Engineers* meets at the House of the Society, 127 East Twenty-third street, New York, on the first and third Wednesdays in each month.

The *Canadian Society of Civil Engineers* meets at its rooms, 112 Mansfield street, Montreal, P. Q., every alternate Thursday.

The *Technical Society of the Pacific Coast* meets at its rooms in the Academy of Sciences Building, 819 Market street, San Francisco, Cal., on the first Friday in each month, at 8 p. m.

The *Tacoma Society of Civil Engineers and Architects* meets in its rooms, 201 Washington Building, Tacoma, Wash., on the third Friday in each month.

The *Association of Engineers of Virginia* holds informal meetings the third Wednesday of each month, from September to May, inclusive, at 719 Terry Building, Roanoke, at 8 p. m.

The *Boston Society of Civil Engineers* meets at Wesleyan Hall, Bromfield street, Boston, on the third Wednesday in each month, at 7:30 p. m.

The *Western Society of Engineers* meets at 78 La Salle street, Chicago, on the first Wednesday in each month, at 8 p. m.

The *Engineers' Club of St. Louis* meets in the Odd Fellows' Building, corner Ninth and Olive streets, St. Louis, on the first and third Wednesdays in each month.

The *Engineers' Club of Philadelphia* meets at the House of the Club, 1122 Girard street, Philadelphia, on the first and third Saturdays of each month, at 8 p. m.

The *Engineers' Society of Western Pennsylvania* meets at its rooms in the Thaw Mansion, Fifth street, Pittsburgh, Pa., on the third Tuesday in each month, at 7.30 p. m.

The *Civil Engineers' Club of Cleveland* meets in the Case Library Building, Cleveland, O., on the second Tuesday in each month, at 8 p. m. Semi-monthly meetings are held on the fourth Tuesday of each month.

The *Engineers' Club of Cincinnati* meets at the rooms of the Literary Club, No. 24 West Fourth street, Cincinnati, O., on the third Thursday in each month at 8 p. m.

The *Engineers' Club of Kansas City* meets in Room 200, Baird Building, Kansas City, Mo., on the second Monday in each month.

The *Engineering Association of the South* meets on the second Thursday in each month, at 8 p. m. The Association headquarters are at The Cumberland Publishing House, Nashville, Tenn.

The *Denver Society of Civil Engineers* meets at 36 Jacobson Block, Denver, Col., on the second and fourth

Tuesdays of each month except during July, August and December, when they are held on second Tuesday only.

The *Montana Society of Civil Engineers* meets at Helena, Mont., on the third Saturday in each month, at 7.30 p. m.

The *Engineers' Club of Minneapolis* meets in the Public Library Building, Minneapolis, Minn., on the first Thursday in each month.

**Central Railway Club.**

The annual meeting of this club will be held at the Hotel Iroquois, Buffalo, N. Y., on Wednesday, Jan. 24, 1894, at 10 o'clock, a. m. The subjects for discussion are: (1) "Air-Brakes—Their Maintenance and Inspection." Committee, J. A. Chubb, James Macbeth and R. Gunn. (2) "Leaky Flues in Locomotives—Their Causes and How to Prevent Them." Committee, J. D. Campbell, La Mott Ames and W. A. Foster.

The annual election will be held at this meeting. The committee appointed to provide for the customary annual dinner announce that, in their unanimous judgment, it would be unwise, in view of the general business depression and the suffering of so large a number through lack of employment, to hold a banquet at this time, and they strongly recommend that the sum of money now in the hands of the committee be devoted to alleviating the condition of the poor in Buffalo.

**New England Railroad Club.**

At the meeting Jan. 10, 1894, President Chamberlain occupied the chair, and announced as the subject for discussion at the next meeting, "Lubrication of the Journals on Rolling Stock, and the Cause of Hot Boxes, and What Can Be Done to Obviate Them," to be opened by Mr. F. D. Adams.

Secretary F. M Curtis was called upon to report in regard to the matter of a hall for the use of the club, and stated that Wesleyan Hall, in which the present meeting was held, could be secured for the use of the club for such months as the club held its meetings, with the exception of September, and as no meeting was usually held in that month by the club, but an excursion was substituted, the hall would not be required at that time. On motion of Mr. Adams the Secretary was instructed by vote of the meeting to secure the hall for the use of the club for the ensuing year.

The President urged upon the members of the club the importance of using their personal efforts to increase its membership, and also requested them to be more prompt in assembling for the regular meetings. He stated that hereafter the meetings would commence promptly at 7:30 p. m. He announced as the subject for discussion for the evening, "Railroad Building, with Reference to Economy of Operating," to be opened by Prof. C. Frank Allen, of the Boston Institute of Technology. This paper appears on another page.

**Montana Society of Civil Engineers.**

The annual meeting of the Society was held on Jan. 13 at Helena, Mont. The programme included an afternoon session at 2 o'clock. This was to be a business meeting with an address by President Haven. Officers for the ensuing year were also to be elected. The evening session at 7:30 p. m. was to be taken up with a paper by Mr. Herron on "Temporary Railroad Bridges Used on the Montana Central," and the discussion of a series of questions proposed by Mr. George K. Reeder relating to the measurement of water and the Montana law on this subject.

**Civil Engineers' Society of St. Paul.**

At the annual meeting of the society on Jan. 8, the following officers were elected for the ensuing year: President, George L. Wilson; Vice-President, J. D. Estabrook; Secretary, C L. Annan; Treasurer, A. O. Powell; Librarian, A. Munster; Representative on the Board of Managers of the Association of Engineering Societies, C. J. A. Morris.

The society is in excellent condition and now has a membership of 54. The library has 300 volumes of standard works on engineering and kindred subjects. During the year the following papers have been presented at the meetings of the society by visiting engineers: "The Marshall Avenue Bridge," by Joseph S. Sewell, of St. Paul, Jan. 9; "Railroad Building in Mexico," by W. N. Wood, Feb. 6; "Utilization of the Minnehaha Water Power," Charles Steiner, of Minneapolis, Feb. 6; "Proposed Tunnel at Duluth," Max Toltz, March 6; "Proposed Deep Waterway from Buffalo to New York City," J. D. Eastabrook, April 3; "Geology of the Lake Superior Mining Regions," E. E. Woodman, May 1; "Asphalt," J. W. Howard, Superintendent of the Barber Asphalt Paving Co., Nov. 6.

**The Freight Claim Association.**

The annual meeting of the Association will be held in Louisville, Ky., March 14. The headquarters of the Association will be at the Galt House.

**Northwest Railroad Club**

At the meeting at St. Paul on Jan. 9 the paper by Mr. W. C. Dallas on "Lubrication," presented at an earlier meeting, was discussed. This paper considered the effect of defects in the construction of locomotives and cars on lubrication and is a very interesting *résumé* of the subject. Mr. George D. Brooke read a paper on "Iron vs. Steel Axles," and the discussion was continued to the meeting on Feb 13, when Mr. J. O. Pattee and Mr. H. L Preston will present additional papers on the subject.

**The Civil Engineers' Club of Cleveland.**

At the meeting on Jan. 9th, 57 members and visitors were present. The election to active membership of Messrs. E. A. Handy and C. A. Carpenter was announced.

A letter was read from Frank R. Lander, Secretary of Social Committee of the Ohio Society of Surveyors and Engineers, announcing the coming annual convention of that society at the Hollanden Hotel. Mr. George E. Gifford then presented a paper entitled "Design of the King Bridge Co.'s New Riveting Shop." Mr. H. F. Coleman presented for discussion a type of truss recently constructed by him, which was discussed by Messrs. F. C. Osborn, L. Herman and W. H. Searles.

**American Society of Civil Engineers.**

The annual meeting of the American Society of Civil Engineers began in New York, Wednesday morning of this week. We go to press too early to give any report of the proceedings. The number of votes cast was 920, the heaviest ballot ever cast in the Society and the result was as follows:

*President*, William P. Craighill, 837; *Vice-Presidents*, Joseph M. Wilson, 814, and Charles C. Martin, 668; *Secretary*, Francis Collingwood, 501; *Treasurer*, John Bogart, 824; *Directors*, William H. Burr, Bernard R. Green, Joseph M. Knap, T. Guilford Smith, Robert B. Stanton, Henry D. Whitcomb.

**Traveling Passenger Agents' Association.**

The twenty-second annual meeting of this Association was held in New Orleans Jan. 9. President J. E. White presided. Detroit was selected as the next place of meeting. The following officers were elected: D. S. Wagstaff, of the Grand Trunk, President; S. J. Gatos, of the Louisville & Nashville, Vice-President; H. G. Holabird, Secretary; J. H. Ward, Texas & Pacific, Annual Orator.

## PERSONAL.

—Mr. W. S. Rogers, formerly the general agent of the Richardson balanced valve, has been appointed Air-Brake Inspector of the Delaware & Hudson.

—Franz August Fölsch, for many years prominently identified with Austrian railroad work and the design and construction of municipal water-works, recently died at Hamburg, Germany, at the age of 70 years.

—Mr. D. F. Whitcomb, who has been Superintendent of the Indianapolis Union Railroad for nearly 10 years, has decided to resign that position on aceount of ill health, and will retire probably before the close of this month.

—The reported appointment of Mr. Thomas Fitzgerald, now Superintendent of Transportation of the Baltimore & Ohio, to be General Superintendent of the lines east of the Ohio River, has been confirmed, though the date on which the appointment is to become effective has not been announced.

—Maj. C. S. Gadsden has been elected President of the Northeastern Railroad of South Carolina, vice A. F. Ravenel, deceased. Major Gadsden will retain his present position as Superintendent of the Charleston & Savannah road, with which he has been connected ever since its construction.

—Mr. F. P. Read, who has been Chief Engineer of the St. Louis, Chicago & St. Paul since last summer, has resigned that position and the office has been abolished. Mr. Read has been made Chief Engineer of the Chicago, Paducah & Memphis, a new railroad organized to build from Altamont, Ill., to the Ohio River at Paducah, Ky.

—Mr. William H. Fitzgerald has been chosen Commissioner of the Associated Railways of Virginia and the Carolinas, in place of R. D. Carpenter, resigned, with office at Richmond. Mr. Fitzgerald has lived in Baltimore for 30 years. He has been agent of the Bay Line, and of the East Tennessee, Virginia & Georgia, and for the past five years has been General Eastern Agent of the Richmond & Danville Dispatch.

— Mr. R. A. Wilkinson, who has been appointed General Right of Way and Tax Commissioner of the several lines comprising the Great Northern system, has been for several years connected with the legal and right of way departments of the road. Mr. Wilkinson is a man of recognized ability, and his promotion to the position to which he has just been appointed has been earned by years of close and faithful attention to his duties.

—Mr. James A. Larnerd, President and General Manager of the New Orleans & Southern, has resigned, and Mr. George T. Taylor, the present Secretary and Treasurer of the company, has been appointed his successor as General Manager. Mr. Larnerd has been President of the company, formerly known as the New Orleans & Gulf, since it was organized. At present he has a contract for railroad work in the West and will devote his principal attention to that.

—Mr. Clarence F. Parker, formerly Assistant to the General Manager, has been appointed Assistant General Manager of the Cairo Short Line, the St. Louis, Alton & Terre Haute. He is the son of Mr. George W. Parker, President and General Manager of the road, and has been in railroad service for the last five years, holding positions in a number of departments, so that he has secured valuable experience in practical railroading and a good knowledge of operating and executive methods.

—Mr. C. C. F. Bent, Superintendent of Construction of the Baltimore & Ohio Southwestern, has resigned that office, to which he was appointed when the consolidation with the Ohio & Mississippi was effected. It is understood that Mr. Bent is to accept a position on an Eastern road. Mr. Bent was for eight years Superintendent of the Ohio & Mississippi Railroad, and has earned a reputation as a very capable operating officer. He has also been Superintendent of the Louisville, New Albany & Chicago and the New York & New England, and was for some years with the Engineering Department of the Pennsylvania road.

## ELECTIONS AND APPOINTMENTS.

*Baltimore & Cumberland Valley.*—At a meeting held in Chambersburg, Pa., Jan. 11, the following directors were elected; David Wills, Gettysburg; John P. Culbertson, W. F. Eyster, Chambersburg; George B. Cole, John W. McPherson, Shippensburg; C. W. Humrichouse, Hagerstown, Md., D. J. Foley, J. M. Hood, Baltimore; J. W. Humbird, Cumberland, Md. David Wills was elected President.

*Baltimore & Hanover.*—The following directors were elected at a meeting held at Hanover, Pa., Jan. 10: J. M. Hood, W. S. Rayner, C. W. Slagle, David Wills, Reuben Young, W. H. Vickery, Jerome L. Boyer, R. M. Wirt, L. P. Brockley, H. E. Young.

*Berlin Branch.*—At the annual meeting held at Abbottstown, Pa., Jan. 8, the following directors were elected: R. N. Meisenhelder, Stephen Keefer, H. A. Young, Hanover; Daniel Eberly, Joseph Wolf, F. K. Hafer, Abbottstown; Jacob Resser, Michael Rebert, William G. Leas, Berlin, Pa. A. W. Eichelberger was re-elected President.

*Columbus, Sandusky & Hocking.*—The officers elected for the consolidated company are the following: President, Charles Parrott; Vice-President, C. D. Friestone; Secretary, E. H. Zurhorst; Treasurer, George W. Sinks.

*Cresson & Clearfield County and New York Short Route.*—The newly elected officers are: President, Samuel Rea; Directors. R. S. Barclay, George S. Bliss, John P. Green, Robert Groff, Enoch Lewis, D. S. Newahl, Wm. A. Patton, Charles Pugh, C. A. Vernon, Henry Welsh and George Wood.

*Erie & Pittsburgh.*—The annual meeting of the company was held in Erie, Pa., Jan. 15, and the following directors were elected: Charles H. Strong, M. H. Taylor, Joseph McCarter and William Brewster, of Erie; Charles S. Fairchild, of New York; George B. Roberts, of Philadelphia, and James McCrea, of Pittsburgh, Pa. Charles H. Strong was elected President, and William Brewster, of Erie, Pa., Secretary.

*Georgia Southern & Florida.*—At a meeting of directors, held in Macon, Ga., Jan. 13, R. S. Collins was elected President, to succeed George B. Turpin, resigned. N. S. Goodwich was elected Secretary and Treasurer, to succeed R. S. Collins, elected President. The road is now operated by Receivers.

*Great Northern.*—R. A. Wilkinson has been appointed Right of Way and Tax Commissioner for the company.

*Gulf, Colorado & Santa Fe.*—P. H. Goodwin, formerly Chief Clerk, has been appointed Assistant General Freight Agent to succeed J. M. Steere, resigned, with office at Dallas, Tex.

*Kings County Elevated.*—The annual meeting was held in Brooklyn, N. Y., Jan. 10 and the following directors elected: E. S Abbot, August Belmont, James R. Carter, James H. Frothingham, James Jourdan, William A. Read, Henry J. Robinson, James O. Sheldon and S. Newton Smith. Mr. Carter is the only new member. He succeeds Wendell Goodwin.

*Lehigh Valley.*—At the meeting in Philadelphia on Jan. 15 the following directors were elected: President, E. P. Wilbur; directors, Charles Hartshorne, William L. Conyngham, William A. Ingham, Robert H. Sayre, James I. Blakeslee, John R. Fell, John B. Garrett, Charles O. Sheer, Rollin H. Wilbur, William H. Sayre, Beauveau Borie, Henry S. Drinker.

*Louisville, Evansville & St. Louis Consolidated.*—Sidney J. Hayden, Traveling Auditor, has been appointed Auditor to succeed E. B. Cooke, deceased.

*Mexico, Cuernavaca & Pacific.*—The annual meeting was held in Denver, Col., Jan. 12, and the following directors were elected: J. H. Hampson, D. B. Smith, W. O. Staples, Charles Wheeler, George L. Hodges, Y. Sepulveda and Luis Mendez. J. H. Hampson, of the City of Mexico, was elected President.

*Monongahela Connecting.*—At the annual meeting of the company held in Pittsburgh Jan. 8, B. F. Jones, George M. Laughlin, W. Larimer Jones, J. Laughlin, Jr., B. F. Jones, Jr., and W. L. King were elected directors to serve for the ensuing year. Henry A. Laughlin was re-elected President; James Laughlin, Jr., Vice-President and Treasurer; W. C. Quincy, General Manager, and Benjamin Page, Secretary and Auditor.

*Montery & Mexican Gulf.*—J. P. Flynn, formerly Auditor, has been appointed Assistant Superintendent with headquarters at Monterey, Mex.

*North Bend & Kettle Creek.*—At the annual meeting of the stockholders held at Gleasonton, Pa., Jan. 8, William Howard, of Williamsport, Pa., was elected President and F. A. Blackwell, of Gleasonton, Pa., General Manager. The directors elected are: W. Howard and A. P. Pearley, Williamsport, Pa.; L. R. Gleason, Canton, Pa.; James Gleason, J. W. Gleason and F. A. Blackwell, Gleasonton, Pa., and Chas. Gleason, Driftwood. J. W. Gleason, of Gleasonton, was elected Secretary, and A. P. Pearley, of Williamsport, Treasurer.

*North Hudson County.*—The annual meeting was lately held in Hoboken, N. J., and the following directors were elected: Henry Offerman, F. J. Mallory, Nicholas Goelz, John H. Ballantine, Myles Tierney, Allen L. McDermott, Edwin A. Stevens, R. W. De Forest and Robert F. Ballantine. The only change is the election of Robert F. Ballantine to succeed S. B. Dod.

*Norwich & Worcester.*—George H. Ball has been elected President of the road, which is operated by the New York & New England. He has for years been a director of the Chicago & Eastern Illinois.

*Phillips & Rangeley.*—The directors have appointed D. W. Davis, of Waterville, Me., Superintendent, vice George Phillips, resigned, and Mason W. Parker General Agent, vice W. S. Eaton, resigned. Mr. Phillips will return to the service of the Maine Central road.

*Queen & Crescent.*—The reported promotion of A. J. Knapp to be Assistant General Passenger Agent at Cincinnati is contradicted.

*Saginaw, Tuscola & Huron.*—W. J. Herbert has been appointed Assistant General Freight and Passenger Agent. His headquarters will be at Saginaw, Mich.

*Southern California.*—Godfrey Holterhoff, Jr., has been appointed Treasurer, Assistant Secretary and Tax Commissioner, to succeed Frank H. Pattee, resigned on account of ill health.

*St. Louis, Cape Girardeau & Ft. Smith.*—Edward F. Blomeyer, formerly General Freight and Passenger Agent, has been appointed Auditor and Paymaster, to succeed Louis B. Houck. The office of Purchasing Agent has been abolished.

*St. Louis, Chicago & St. Paul.*—F. P. Read, having resigned to accept service with another company, the office of Chief Engineer has been abolished.

*Union Pacific.*—H. A. Johnson has been appointed Assistant General Freight Agent, with headquarters at Denver, Col. He succeeds F. Wild, who became General Freight Agent of the Union Pacific, Denver & Gulf, a position which Mr. Johnson held when the road was operated as an independent line before the lease to the Union Pacific.

## RAILROAD CONSTRUCTION, Incorporations, Surveys, Etc.

**Caldwell & Northern.**—The contractors have recently resumed work on this short road in North Carolina. It has been nearly all graded for 15 miles beyond Lenoir to Wilson's Creek, but no work has been done since the summer. J. F. Montgomery, of Lenoir, is the Chief Engineer.

**Cleveland & Southwestern.**—The officers of the company are now pushing the right of way matters on this line, and last week had several conferences with the city authorities of Cleveland, O., in regard to an arrangement with the city to secure the right of way through land owned by the city. The right of way has been secured for nearly half the distance of the projected line, principally on the southern end of the line. The road, if constructed, will give the Cleveland, Lorain & Wheeling an independent entrance into Cleveland from a point on its line near Medina. The length will be about 20 miles.

**Dallas & Southwestern.**—The firm of Burkitt & Murphy, of Palestine, Tex., have taken the contract for

building this railroad between Dallas and Palestine, Tex. The chief projector of the road is G. W. Burkitt, of this firm. He has just finished a tour over the proposed route, going from Palestine through Anderson County, Malakoff, in Henderson County, Kaufman and Dallas. A second proposed location would take the line through Athens, and a party is now going over that route. The distance between the two towns will be over 100 miles. The intervening country is good farming land, well watered, part of the line being through a heavy timber land. The projectors will depend upon local assistance for part of the funds for building the road. The city of Dallas will be asked free right of way through the city and also through the county limits, and probably also a cash subsidy.

**Duluth & Winnipeg.**—A survey was begun this week for the long proposed extension northwest from Deer River, Minn., now the terminus of the operated line, about 110 miles from Duluth, Minn. The survey is in charge of H. J. Payne, Chief Engineer of the Duluth, South Shore & Atlantic road, which is now operating the Duluth & Winnipeg. The survey will be through thick forests and will be pretty difficult work for the engineers, the ground now being covered with a heavy fall of snow. It is not expected that the engineers will finish the survey before April. The road is projected to reach St. Vincent, a town near the International Boundary Line south of Winnipeg.

**East & West of Alabama.**—Articles of incorporation have been filed in Alabama by Eugene Kelley, Thomas K. Kelley, Thomas H. Kelley, Daniel F. Sullivan, Eugene K. Austin, of New York, and Charles P. Ball, of Cartersville, Ga., for the reorganized East & West Railroad, which extends from Cartersville, Ga., to Pell City, Ala., 117 miles. The above road has been in a receiver's hands until recently and when sold under order of court, the above gentlemen became purchasers.

**Ebensburg & Black Lick.**—The contractor, Charles McFadden, of Philadelphia, since he resumed work on this road in December has gradually increased its force, and now has about 700 men employed beyond Ebensburg, Pa. The road is a branch of the Pennsylvania and will be built from Ebensburg to Black Lick Station on the Indiana Branch of the Pennsylvania, a distance of something like 10 miles. Of this distance the grading on five miles beginning at Ebensburg is now finished.

**Elkton & Southern.**—The incorporation papers have been completed. The capital stock is placed at $110,000. The road, as projected, will connect with the Baltimore & Ohio and Lancaster, Oxford & Southern roads at Childs Station, passing through Cecil County to a point on the Baltimore & Delaware Bay road, at Lambson Station. Z. Porter Luzby, D. P. Davis, George Biddle, H. H. Brady, J. J. Williams, George S. Woolley, John S. Wirt, Manly Drennen and Dr. Howard Bratton are the incorporators.

**Fort Bragg Lumber Company.**—The railroad proposed by this company and briefly referred to last week, is intended to reach coalfields in the northern part of Mendocino County, Cal. The mines have been the property of James C. Flood and John W. Mackay, who have recently given an option on the property to the Fort Bragg Lumber Company, which has had experts investigating the value and extent of the coal deposit for some months. The lumber company is said to control about 100,000 acres of timber land near Fort Bragg and it has built a logging railroad about 10 miles long to reach the timber. Surveys have been made for the extension of this line about 25 miles further west to Willits. The coal mines referred to are about 20 miles north of Willits, but no survey has been made beyond the latter town. Fort Bragg is on the Pacific Coast, a short distance above Mendocino City. It is thought that the sale of the property to the Fort Bragg Lumber Company is not likely to fail, and if the property is acquired by that company it will at once extend its railroad and actively develop the mines. Thomas L. Johnson, of Michigan, and ex-Governor R. A. Alger are reported to be interested in the company.

**Gulf, Beaumont & Kansas City.**—An extension of the line 10 miles beyond the present terminus, making the total length of line north of Beaumont 30 miles, has recently been put under contract. The contract includes over a mile of trestling and is to be completed during May.

The engineers who have been surveying the line to the projected terminus in the northern part of Jasper County, Tex., have recently returned to Beaumont and report having secured a good site for the bridge across the Neches River and a favorable line to the quarries in Jasper County, to which the road it to be built. It is now in operation for 15 miles. S. A. MacNeely is the General Superintendent.

**Indianapolis, Anderson & Northeastern.**—S. A. Baxter, of Lima, O., is President, and W. E. Heckedon, of Indianapolis, Secretary of this proposed road in Indiana. These officers recently filed for record in various counties in Indiana copies of the mortgage for $1,000,000 in favor of the Manhattan Trust Company, of New York, recently authorized by the company's stockholders. The proposed line is from Muncie, west through the town of Anderson, and thence south to Indianapolis, a distance altogether of about 90 miles. It is said that the company has been organized in the interest of the Lake Erie & Western to give that company an independent entrance into Indianapolis from Muncie, which is now its present Western terminus. The Cleveland, Cincinnati, Chicago & St. Louis now has a line between these two points.

**Indiana & Northern.**—It is reported that the Hammond Packing Company will construct a belt line from Hammond, Ind., to Blue Island, Ill., to be known as the Indiana & Northern, which will cross the tracks of the Michigan Central, Monon, Erie, Panhandle, Wabash and Rock Island roads.

**Little Rock, Hot Springs & Texas.**—A body called the Commercial League, of Little Rock, which has had in charge the raising of the sum of $50,000 as a subsidy for this road, has informed Uriah Lott, the projector of the road, that the sum mentioned has been subscribed, and calling upon him to carry out his part of the agreement. The town of Hot Springs also has succeeded in getting subscriptions amounting to $50,000 to aid the project. President Lott has organized a party of engineers, which is now surveying south of Hot Springs. This work is in charge of J. R. Nelson, of San Antonio, Tex.

**Middle Georgia & Atlantic.**—This road was completed to Covington, Ga., on Jan. 6. This completes the line from Milledgeville to Covington, a distance altogether of 50 miles. The 20 miles between Milledgeville and Eatonton is the Eatonton branch of the Central of Georgia, and has been operated by the above company since October of last year. The extension of the line into Covington, which has just been completed, is about 25 miles long, beginning at Newborn.

**New York & Putnam.**—This company was incorporated at Albany, N. Y., last week, with a capital of $6,500,000. This is a reorganization of the New York & Northern Railroad Company, which was sold at foreclosure sale in December last. The directors are: J. Hood Wright, Charles H. Coster, Temple Bowdoin, Anthony J. Thomas, Edward M. Robinson, Arthur P. Sturges, Charles H. Pond and C. Kinney Smith, of New York City; Thomas W. Joyce, James S. Davie and A. G. Bradley, of Brooklyn.

**Path Valley.**—Last week work was commenced on the tunnel proper south of New Germantown, Pa. An air compressor plant will be erected on the Perry County side and then the steam drills will be worked on both sides of the mountain. Gangs of men are pushing the grading between New Germantown and the mountain, and at Doylesburg, Franklin County.

**Philadelphia & Frankford.**—The bondholders have agreed to furnish the $250,000 necessary to complete this road, under an arrangement with the Receivers of the Philadelphia & Reading, which will operate the new line. The branch extends from Logan Station to Crescentville, and thence into Frankford, and has already been graded, bridges built and the roadbed is nearly ready for the tracks. Work on the road stopped when the Reading defaulted in the payment of interest on the bonds, which it guaranteed. The bondholders will now complete the road as rapidly as possible, since the money necessary for the work is assured. The bondholders' committee is composed of George H. Earle, Jr., Richard Y. Cook and William H. Rhawn. The Receivers have assented to the issue by the Reading Railroad of $250,000 notes bearing 6 per cent. interest, to run for 10 years after the termination of the receivership. These notes will be purchased by the Philadelphia & Frankford bondholders and the proceeds used for finishing the construction work and payment of the interest now in default. The mortgage loan on the branch road is $500,000 five per cent. bonds, and the stock of the company is held by the Reading Railroad.

**Pittsburgh, Morgantown & Fairmont.**—This road, which is a part of the Baltimore & Ohio system, between Smithfield, Pa., and Morgantown, W. Va., is rapidly nearing completion. The chief difficulty in the way has been the bridge over Cheat River near the state lines. That structure is now completed, and construction trains would have been running over it before now but for the discovery of a faulty piece of material in one of the spans on the final inspection, and the necessity for removing and replacing it. The road is ballasted from Smithfield to Point Marion, Pa., where the Cheat River bridge is located. From there to Morgantown the ballasting is yet to be done. The ballast comes from the furnaces on the Pennsylvania side of Cheat River so that the work cannot proceed till the bridge is opened. The line from Smithfield south to Fairchance is in operation, as is that from Morgantown south to Fairmont. The Cheat River bridge consists of five spans 135 ft. each, and a plate girder span of 85 ft. The new part of the road from Uniontown 10 miles above Smithfield to Morgantown is about 32 miles. From Morgantown the line follows George's Creek to Morton's mills, where it passes through Morgan's Summit by a tunnel 450 ft. in length, the only tunnel on the line. Thence it follows Grassy Run to the Cheat River, and the Valley of Cheat to the Monongahela River, thence to Morgantown. The line connects Pittsburgh with the Marion County, W. Va., coal and coke fields, which have come into prominence within the past few years, giving the Baltimore & Ohio also a connection with three short roads which penetrate the interior of West Virginia and securing the trade of that section to the Baltimore & Ohio and Pittsburgh, the nearest market. The workmen are now putting up the station buildings along the upper part of the line. A siding 3,000 ft. in length is being built at Cheat Haven, and it will be the longest siding on the line. When the road will be opened for traffic is still problematical, but it will not be later than March, unless there is some unforeseen delay.

**Tampa & Thonotosassa.**—This railroad is now reported completed, the work of grading having been begun late in November. It is a branch of the Plant System and begins at Ybor City, a station on the South Florida a few miles from Tampa. It extends from that point north to Thonotosassa, 14 miles. It will be opened for traffic in a few days.

**Texarkana & Fort Smith.**—General Manager Hubbell is now arranging to carry on the work on the southern extension from Texarkana, Tex. He proposes to extend the line immediately to the Sulphur River, about eight miles. The line has been surveyed, and if $30,000 is subscribed in Texarkana for the road, work will begin at once.

**Wellston Belt.**—This company has been organized to build a line from McArthur Junction in Vinton County, Ohio, near Wellston, to Jackson, the county seat of Jackson County. The line will connect with five of the railroads between these points. It is said by the projectors that they will use both steam and electricity for motive power. The directors elected on Jan. 5 were Harvey Wells, J. C. Clutts and H. S. Willard, of Wellston, and C. L. Currier and Isaac E. Adams, of Chicago.

**Wyandotte & Southeastern.**—This company filed articles of incorporation in Arkansas, with a capital stock of $300,000. The road is to be constructed through Grant and Hot Springs counties from Wyandotte, in the latter county, in a southeasterly direction to Little Rock, the log railroad of J. H. Hamlin & Son forming part of the new line. Its corporators are J. H. Hamlin, Portland, Me.; B. F. Copeland and W. F. Hill, Little Rock; T. F. Doyle and W. C. C. Dunnough, Sheridan, Ark.

## GENERAL RAILROAD NEWS.

**Chester & Lenoir.**—Judge Gary, of the South Carolina Circuit Court, has appointed David Hemphill, of Chester, S. C., permanent Receiver of this railroad, formerly operated as a branch of the Richmond & Danville.

**Georgia Southern & Florida.**—The Committee of bondholders proposes to ask the courts in Georgia to appoint Skipworth Wilmer as coreceiver with Willis B. Sparks, the present Receiver. The Committee is said to represent $2,707,000 of the $3,400,000 bonded debt of the road. If no appeal is taken from the order of the Macon court for the sale of the road, the sale will occur the first week in March.

**Illinois Central.**—The income from tariff for the five months ending Nov. 30, 1893 and 1892, show the following comparisons:

| | 1893. | 1892. | Inc. |
|---|---|---|---|
| Miles operated | 2,888 | 2,888 | |
| Gross earn | $10,409,820 | $8,390,648 | $2,019,172 |
| Oper. expen. & taxes | 6,695,213 | 6,163,954 | 531,259 |
| Net earn | $3,714,607 | $2,226,694 | $1,487,913 |

The gross receipts from traffic for the month of December, 1893, are estimated at $1,702,691; the receipts for December, 1892, were $1,803,713, being an estimated decrease of $101,022.

**Indianapolis, Decatur & Western.**—A petition was filed in the Superior Court at Indianapolis last week asking that this railroad be ordered sold again, and alleging that the purchasers of the road, when it was sold in September last, have failed to comply with their contract. At that time the road was purchased by Thomas B. Atkins, Chairman of the Reorganization Committee. An extension of time was granted the purchasers some time ago, but the petition alleges that they have failed to comply with their contract.

**Lake Erie & Detroit River.**—The company announces that it will apply at the next Dominion Parliament for confirmation of its lease of the London & Port Stanley road. This road is owned by the town of London, Ont., and at present is operated under a temporary lease by the Michigan Central. The 20-year lease of the road held by the Grand Trunk expired in 1892 and the town authorities refused to renew the lease to that company on the old terms. Proposals for a lease of the road were advertised, but the town found it a rather difficult matter to secure a responsible offer on what it considered reasonable terms. One company organized to operate the line defaulted on its payments to the city within a few months. During the latter part of 1893 the proposition of the Lake Erie & Detroit River to operate the line was accepted.

**Louisville & Nashville.**—The directors, at their meeting in New York last week, decided not to declare a dividend on the capital stock at the present time. The gross earnings reported were the smallest in several years, and though operating expenses were $1,300,000 less than in 1892, the decrease in net earnings was $631,726. The following statement of earnings for the two years was submitted:

| | 1893. | 1892. | Inc or dec. |
|---|---|---|---|
| Gross earn | $9,761,073 | $11,684,929 | D. $1,923,856 |
| Oper. expen | 5,881,477 | 7,173,607 | D. 1,292,130 |
| Net earn | $3,879,596 | $4,511,322 | D. $631,726 |
| Fixed charges | 2,850,750 | 2,720,597 | I. 130,153 |
| Net earn | $1,028,846 | $1,790,725 | D. $761,878 |
| Other income | 161,190 | 217,420 | I. 15,242 |
| Total | $1,190,036 | $2,008,145 | D. $818,109 |
| Loss on other roads | 81,934 | 62,604 | I. 19,330 |
| Surplus | $1,108,102 | $1,945,541 | D. $837,439 |

For the six months last year a dividend of $1,056,000 was paid, leaving a balance of $889,541. In explanation of the passing of the dividend in the face of a net surplus equal to 2.1 per cent. upon the capital stock, Mr. August Belmont, Chairman of the Board, has issued a statement on behalf of the management, which is in substance that this surplus is partly the result of economies prompted by a conservative appreciation of the danger of the decreased revenues of the company, which seem likely to continue for some time to come. The property requires new equipment as well as maintenance of way improvements, which the payment of dividends from the present small margin of profit would tend to delay. Finally, attention is called to the fact that the first half of the fiscal year is usually the most remunerative, and in the present condition of affairs the rate of surplus earnings shown above cannot be depended upon, but may possibly be required in the operations of the last half of the year.

**Marietta Terminal.**—T. D. Dale has been appointed Receiver of this company, whose property consists of the Union Station at Marietta, O., and about a mile of main line and sidings in the city.

**New York & New England.**—The application for the appointment of a permanent receiver for the company was heard by Judge Wallace in the United States Circuit Court at New York on Jan. 10, in accordance with the order entered when Thomas C. Platt was made temporary Receiver. Half a dozen interests were represented by counsel, each with its own candidate for permanent receiver. Counsel for the directors asked for the confirmation of Mr. Platt as receiver, in accordance with resolutions adopted by the Board, instructing counsel to appear before the courts and deny the allegations of improper conduct on the part of the present management, but also to ask that the Court appoint T. C. Platt as sole receiver for the road, this being deemed for the best interest of the road and all concerned, pending reorganization, and to prevent rival corporations from getting control of the property. The appointment of Mr. Platt was opposed by the second mortgage bondholders, who charged mismanagement of the road, and as Mr. Platt was a director his appointment would be improper. W. T. Hart, of Boston, was suggested as receiver on behalf of the second mortgage bondholders. Holders of 22,000 shares of common stock opposed the appointment of either Mr. Platt or Mr. Hart. They charged that collusion existed between Mr. Platt and President McLeod, and the Court ought to refuse to appoint Mr. Platt. Most of the second mortgage bonds they claimed were held in the interest of the New York, New Haven & Hartford Railroad Company, which was not friendly to the New England, and he charged that Mr. Hart's name was being urged for receiver in the interest of the New Haven. W. D. Bishop, a director of the New Haven road and a large owner of the second mortgage bonds, said that the New Haven road owns about $100,000 of the second mortgage bonds, which it took ten years ago in settlement of a traffic balance, and $15,000 of the first mortgage bonds as an investment for its sinking fund. Beyond these amounts he said that the New Haven is not in any way interested in the securities of the New England road. The appointment of Charles Parsons, of New York, formerly President of the road, was urged by a number of stockholders. Judge Wallace reserved his decision. The receivership hearings in the other states in which temporary receivers were appointed have been adjourned to a later date in January.

**Nicaragua Canal Co.**—The Reorganization Committee of the company announces that the holders of approximately 75,000 shares of the company's stock have as-

sented to the plan. Chairman Bartlett of the Committee says that those who have expressed dissatisfaction with the plan hold only a small amount of the stock, and seem to overlook the fact that the company is bankrupt, and that prompt action on the part of the stockholders is necessary to prevent the success of a scheme to force a sheriff's sale of its assets.

**Peoria, Decatur & Evansville.**—Judge W. J. Allen, of the United States Court, at Springfield, Ill., has appointed as Receivers Perry Huston, of Evansville, and E. O. Hopkins, at present General Manager of the road. Mr. Hopkins is one of the Receivers of the Louisville, Evansville & St. Louis Consolidated. The application was made by the officers of the company. The bonded indebtedness consists of $1,287,000 first mortgage bonds, issued 1880, on line from Pekin to Mattoon; $1,470,000 first mortgage bonds issued 1880 on the line from Mattoon to Evansville, known as the Evansville Division, and $2,088,000 second mortgage bonds issued in 1886 on the entire line; also $800,000 floating indebtedness.

**Philadelphia & Reading.**—The following basis for a reorganization plan has been published the past week, with the statement that it has been under consideration by counsel of the Receivers and the general mortgage bondholders: The floating indebtedness of the company, including the Receivers' certificates, amounts in round numbers to $12,500,000. The Finance Co. of Pennsylvania has had charge of the coal and coal accounts of the Philadelphia & Reading Coal & Iron Co. for the last 15 months, and the advances have been increased so that they now amount to $3,000,000. The security in the possession of the Finance Co. is believed to be sufficient to warrant an issue of $6,000,000 of 6 per cent. 10-year trust certificates, which could be sold at par. The 5 per cent. collateral trust bonds owned by the Reading Co. amount to $10,000,000, and experience has shown that these bonds occupy a strong position, being protected by the shares and bonds of the tributary and affiliated lines of the Reading system. If they can be disposed of to the security holders and stockholders of the company at a fair price, a sufficient amount will be realized to pay off the floating debt and receivers' certificates, and to provide money to deal with some of the car trusts which mature shortly.

It will also be necessary for the general mortgage bondholders to fund their coupons for five years, and it is proposed to form a syndicate to purchase at par, for cash, the coupons as they mature, thus giving to the bondholders money for the interest as it falls due, reserving to the bondholders, however, the privilege of taking the coupon trust certificates themselves if they desire to do so. With this relief to the company, during the period of funding it will be able to take up all its maturing obligations, including the equipment notes, and have ample means, it is believed, for conducting its business. At the expiration of five years, under the terms of the last reorganization, the company will come into possession of $10,000,000 of general mortgage 4 per cent. bonds. It will also be necessary that a settlement should be made with the holders of the Philadelphia, Reading & New England bonds, for the release of the guaranty of the Philadelphia & Reading. If no plan of reorganization can be carried through within a reasonable time, it is feared the United States Court will insist on action been taken by the bondholders, or the receivers discharged, leaving the property open to attack by its creditors.

**Quaker City Elevated.**—Following close upon the decision of the Dauphin County Court in the elevated railroad right of way litigation in Philadelphia which was favorable to the projects, adverse reports from two masters appointed to report upon the bills in equity filed by right of way owners have been made public. The masters recommend the Court of Common Pleas to issue a perpetual injunction restraining the above company from building its road. The litigation will be carried to the Pennsylvania Supreme Court. The masters' argument is that the elevated railroad was incorporated under the railroad act of 1868, which prohibits the construction of street railways under its provisions; the Quaker City Railroad is, in fact, a street railway, and therefore has no corporate powers to construct its proposed line. The Dauphin County Court found in the similar case against the Northeastern Elevated that it was a street railway, but also found that the supplement of 1887 to the act of 1868 permits the incorporation of elevated or depressed passenger railways, and that the Northeastern Company is authorized to occupy a street lengthwise; that its charter is valid, and that it may go on with its work, having already obtained the consent of Councils therefor.

**Richmond & West Point Terminal.**—A further step in the reorganization of the company was taken last week in entering a judgment against the company for $17,813,845 in favor of the Reorganization Committee. This is the amount, with interest and costs of suit added, due on the collateral trust—five and six per cent. bonds—after deducting about $55,000, the sum paid by the Reorganization Committee at the auction sale last summer for the collateral on which the bonds were secured. The bonds foreclosed have been in default since the summer of 1892. There were two series, one for $5,500,000 bearing six per cent. interest, and the other for $11,065,000 bearing five per cent. interest. The bonds represented a controlling interest in the Richmond, Danville & Central of Georgia and East Tennessee Railroad companies, all of which are in the hands of receivers. Drexel, Morgan & Co. have charge of the plan of reorganization of all the companies excepting the Central of Georgia.

**San Pete Valley.**—The directors have recently authorized the issue of $75,000 in bonds on the new extension to Manti, Utah, to which town the road has just been opened.

**Union Pacific.**—A statement was issued by the Receivers this week, showing the earnings and expenses for November of the entire system, as follows: Gross earnings, $3,306,072; operating expenses, exclusive of taxes, $1,995,094; net earnings, $1,310,978. For the eleven months ending Nov. 30 the gross earnings were $34,689,087, and the net earnings $11,014,640, a decrease in the net earnings as compared with 11 months last year of $4,300,000.

## TRAFFIC.

### Traffic Notes.

The Chesapeake, Ohio & Southwestern has withdrawn from the Memphis Passenger Association.

The number of freight cars passing over the cantilever bridge of the Michigan Central at Niagara Falls for the first seven days in January was 8,365, an average of 1,195 cars a day. The best previous record was two years ago when the daily average for a week was 905 cars.

The New York, New Haven & Hartford has notified the New York & New England that it will demand prepayment on freight received from the latter road bound for points west of the Hudson River over lines with which the New Haven has not a through billing agreement.

The California Traffic Association succeeded in raising the money necessary to pay the bonus to keep the North American Navigation Company's ships running so as to maintain a competing freight line between San Francisco and the Atlantic coast. About $100,000 was raised within a few days.

The Atchison, Topeka & Santa Fe, the Union Pacific, the Oceanic Steamship Company and the Peninsular & Oriental Steamship Company have formed a combination all-around-the world route, to be known as the American & Australian Line. The average time proposed by the new route for a trip is 70 days, and the fare, including every necessary accommodation, is $610.

The New York, New Haven & Hartford has established a "Suburban Parcel Delivery" between New York and Stamford, Conn., 33 miles out. This department is evidently an adjunct of the baggage department intended to secure some revenue from the large number of packages which season ticket passengers wish to have carried in baggage cars. Only parcels weighing 25 lbs. or less and of $25 value, or under, will be taken, and the charge for stations within 20 miles is 15 cents. To Stamford it is 25 cents. Gummed stamps will be issued and sold in quantities to those who may wish to prepay in the most convenient manner.

The Nebraska State Board of Transportation has decided, in a complaint about the rates on hay over the Fremont, Elkhorn & Missouri River Railroad, that the rates recently established by the road, which are considerably higher than those in force for several years past, are unjust. The Board has issued an order to restore the rates to the figures in force prior to Oct. 3 last, which makes a reduction from 10½ cents per 100 lbs. to 7 cents per 100 lbs. from the stations east of Stuart, on hay going to Omaha. The officers of the road say that their voluntary reduction to seven cents for a time was made to stimulate business, and that on general principles it is far too low.

The Treasury Department has had a controversy with the Southern Pacific over the transportation of baggage for the army. A troop of cavalry made a short trip in California and carried nearly 200,000 lbs. of freight, such as camp utensils and livestock. It has been the practice of the road to charge freight rates for such shipments, making a deduction of 150 lbs. for each man as a baggage allowance. The War Department insisted that a deduction of the full allowance of 150 lbs. per man should be made, regardless of the character of the freight carried, and thereupon the railroad, after making the deduction for 58 men, charged for the balance at regular baggage rates, nearly $4,000. The Third Auditor allowed only ordinary freight charges, or $500. The Controller says: "Free carriage of baggage is a personal privilege. The Government has no right to claim exemption on account of paying a soldier's fare, unless the goods are the property of that particular man. By paying the fare of one man it does not gain the privilege of having 150 lbs. of its own goods or those of some other man carried free. The carrier should furnish baggage cars for transporting the personal effects of the men, not exceeding 150 lbs." All of which red tape could be avoided by making a ticket rate with the stipulation that all baggage should be charged for.

### Chicago Traffic Matters.

CHICAGO, Jan. 17, 1894.

When the conference of trans-continental lines adjourned last week it appeared as if there was no possibility of an agreement with the Canadian Pacific being reached. Since then, however, efforts have been made to come to a compromise and a further conference is being held this week. None of the roads are willing to place themselves in the position of being charged with the responsibility of the inevitable rate war which is sure to follow a failure to come to an agreement. The situation now appears to be about this: The American lines are entirely willing to concede the demand of the Canadian Pacific for differentials via Victoria and the water route to San Francisco, and some of the lines are willing to assist the Canadian Pacific in the way of through route and division facilities via Portland if it will not insist upon its demand for a differential via Portland. The Southern Pacific, however, will not agree to any more favorable divisions than those now in force, which the Canadian Pacific claims to be practically prohibitory. The meat of the whole dispute is that the Canadian Pacific is determined to enter San Francisco on an equal footing with the American lines, and the Southern Pacific is as equally determined that it shall not. The Santa Fe intimates that if a differential is conceded the Canadian Pacific via Portland it (the Santa Fe) will demand a differential via Los Angeles. None of the other lines will concede this, and the inevitable result must be a long and expensive rate war. With the Northern Pacific, Union Pacific and Santa Fe in the hands of receivers, and the Southern Pacific being willing to co-operate with either or all as against the Canadian Pacific, it would seem that the American lines would have the best of the fight, but at a great loss in revenue, as the Canadian Pacific is known to be a determined fighter. This renewed failure to reach an agreement is pointed to by some in a "told-you-so" manner, they having all along claimed that the Canadian Pacific would never agree to anything which did not let it into San Francisco. The only result of the conference has been to place the two sides squarely on record and define terms on which an agreement must be effected or on which the matter must be fought out.

The Alton recently complained to the Western Passenger Association that the privilege accorded the Illinois Central of making rates independently of the association from association territory to points on its line outside of association territory and south of the Ohio River had been the means of placing the Alton at a disadvantage, especially in the matter of the "land-seekers' excursions" to Southern points now being conducted by the Illinois Central. The matter will be taken up by the Association, but it is probable that the Illinois Central will not be inclined to object to a reasonable restriction which shall protect the Alton and the other St. Louis lines.

It has been agreed by the Northwestern lines to keep in effect the 12½ cent rate on flour and grain from St. Paul and Minneapolis to Chicago in connection with the rates of the Eastern lines.

The usual conferences between the managers of the lake-and-rail and all rail routes have been commenced, looking to an agreement to govern rates the coming season. In this connection a rumor is current that the northwestern lines are endeavoring to get the "Soo" line and the lake and-rail lines to agree to a division of tonnage for the coming season. Of course none of the interested parties will confirm the report, but its plausibility lies in the fact that it is the only possible solution for the annual scramble for business and the consequent demoralization which last season attained such proportions as to cause even the lake-and-rail lines to stop and seriously consider whether they were not preparing a legislative noose for their own hanging another season.

The Freight Committee of the Central Traffic Association last week decided that all commodity rates in the territory of the association be abrogated April 20, unless prior to that date they are submitted to and reauthorized by the association. Fifth-class rates were given to carloads of iron and steel from the salvage of the World's Fair; if offered with the statement that they are to be melted, such shipments may take scrap iron rates. It was decided that the date for the taking effect of the new scale basis of class rates should be postponed until May 1, from March 1.

All Chicago and Ohio River freight rates have been advanced to the old figures.

There is some talk among the Ohio River lines of shortening the running time between Chicago and Cincinnati and other Ohio River points. Probably nothing will be done for the present.

Other Western roads have met the action of the Union Pacific in extending the limits of tickets to the California mid-winter fair to July 15.

An important decision has recently been handed down by Chairman Caldwell of the Western Passenger Association. Complaint was made against the Chicago, Burlington & Quincy some time since that its contracts with Cook & Sons and Gaze & Son for the sale of excursion tickets in association territory was in violation of the agreement of the association. The Chairman rules that inasmuch as these contracts were in existence prior to the formation of the association and were disclosed at the time, they are not a violation of the agreement. He authorizes the other lines to equalize by making similar arrangements at Chicago and Minneapolis if they desire.

Several conferences have recently been held between the Advisory Committee of the Western Passenger Association having charge of the new immigrant routing arrangement, and the immigrant agents with whom it is proposed to make amicable arrangements. Some friction was caused by the position of the Union Pacific in determining to handle its business independently of the Association and the fact that that company had a contract with one of the agents who proposed working in harmony with the Association. The arrangement which it is proposed to make with these agents is to allow them an agreed commission with the proviso that all the business they secure shall be routed by the joint agent of the association in New York, and unless they make contracts with the association to this effect their orders are not to be honored by any of the roads in the agreement. In this case the difficulty was overcome by the agent in question canceling his contract with the Union Pacific. While the latter company declines to become a party to the agreement, the other roads profess to believe that its assurances are made in good faith that it will not pay commissions in excess of the agreed association rate.

A conference was had last week between representatives of the Central Traffic and Western Freight Associations relative to a rearrangement of divisions between Eastern and Western lines of freight passing across the Mississippi River. No agreement was reached, however, the matter being referred to a special committee who are to meet Jan. 25. Several attempts have been made at various times during the past three years to bring about a readjustment of the present divisions, which are unsatisfactory in many ways, but heretofore no new basis has found any favor. The situation is complicated by the position of the Indiana, Illinois & Iowa, the Elgin, Joliet & Eastern, and similar belt lines which cross all the important western and eastern lines at junction points so as to materially shorten the haul from the Mississippi River. The 3 I road, for instance, has been receiving a division of the through rate from the Western lines and another from the Eastern lines. The total of the two has been sufficient to enable that line of it so chose to offer material inducements to shippers for routing freight over its rails, and still have a reasonable return for the service. Its conections are willing to admit that by reason of its geographical situation it is able to handle freight cheaply and at a considerable saving of time over what would be the case were the freight brought to this city, and is therefore entitled to a reasonable consideration. The point at issue appears to be what this reasonable consideration is.

Eastbound shipments last week continued phenomenally large. They are to be accounted for only on the supposition that either there was a large lot of delayed freight accepted as "in transit" prior to the advance in rates, or that notwithstanding the agreement some of the lines are up to their old tricks. With the exception of the Grand Trunk, which nearly doubled its tonnage over the preceding week, the tonnage is distributed about as for the preceding week.

The shipments of eastbound freight, not including livestock, from Chicago, by all the lines, for the week ending Jan. 12 amounted to 129,055 tons, against 125,790 tons during the preceding week, an increase of 3,265 tons, and against 79,736 tons for the corresponding week last year. The proportions carried by each road were:

| Roads. | W'k to Dec. 22. | | W'k to Jan. 6. | |
|---|---|---|---|---|
| | Tons. | P. c. | Tons. | P. c. |
| Michigan Central | 15,471 | 12.0 | 17,132 | 13.6 |
| Wabash | 9,576 | 7.4 | 10,486 | 8.3 |
| Lake Shore & Michigan South. | 14,417 | 11.2 | 17,912 | 14.2 |
| Pitts., Ft. Wayne & Chicago | 26,989 | 20.9 | 25,800 | 20.5 |
| Pitts., Cin., Chicago & St. Louis | 20,478 | 15.9 | 17,556 | 14.0 |
| Baltimore & Ohio | 4,293 | 3.3 | 5,495 | 4.4 |
| Chicago & Grand Trunk | 11,402 | 8.8 | 5,992 | 4.8 |
| New York, Chic. & St. Louis | 11,217 | 8.7 | 9,992 | 7.9 |
| Chicago & Erie | 12,823 | 9.9 | 12,250 | 9.7 |
| C., C., C. & St. Louis | 2,389 | 1.9 | 3,180 | 2.6 |
| Totals | 129,055 | 100.0 | 125,790 | 100.0 |

Of the above shipments 17,406 tons were flour, 88,009 tons grain and millstuff, 6,807 tons cured meats, 9,375 tons dressed beef, 1,155 tons butter, 1,120 tons hides and 2,523 tons lumber. The three Vanderbilt lines carried 31.9 per cent., the two Pennsylvania lines 36.8 per cent.

*(Other Chicago traffic news will be found on page 48).*